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ABSTRACT

These materials for a six-unit course were developed to prepare secondary and postsecondary students for entry-level positions in landscape management. The six units are on orientation, hand tools, light power equipment, water and watering techniques, planting and maintaining plant beds, and establishing and maintaining turf. The first section is designed to show teachers how to use the materials and includes an explanation of instructional elements, an instructional task analysis for each unit, and a list of 33 references. The instructional elements for the units include objectives, suggested activities, information sheets, transparency masters, assignment sheets, job sheets, tests, and test answers. Some elements, such as the information sheets, include photographs, diagrams, and line drawings. (CML)

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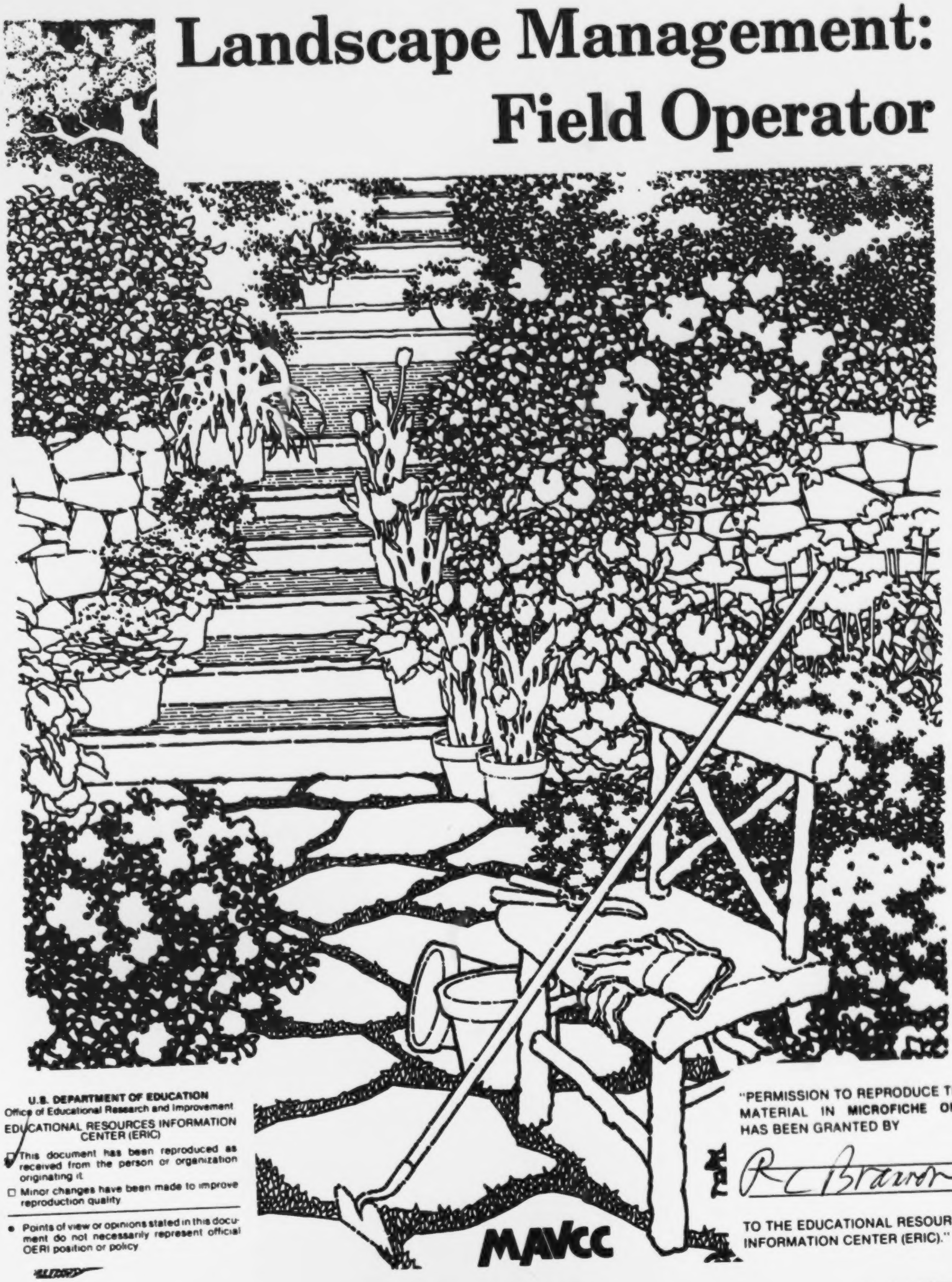

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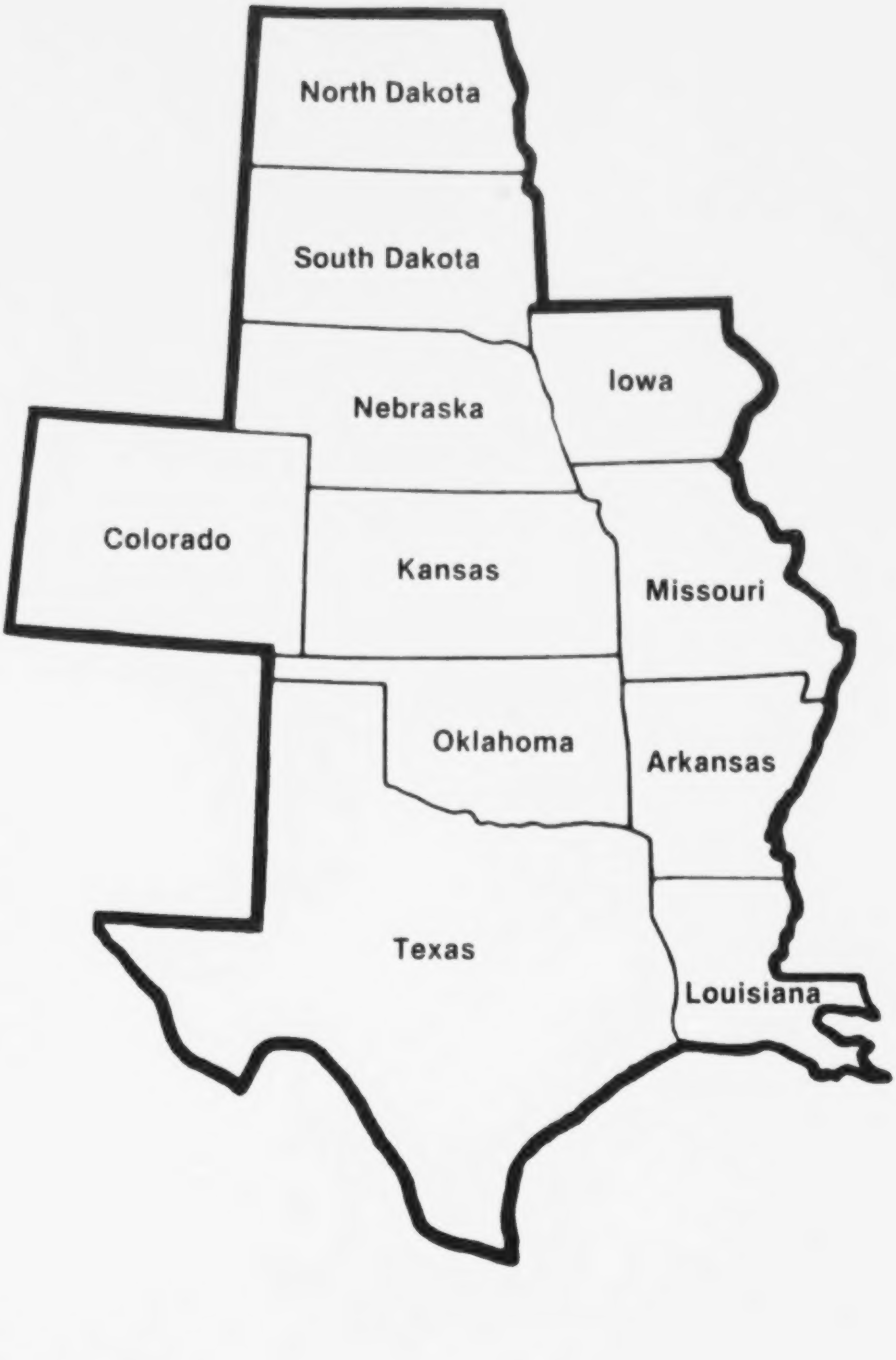
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LANDSCAPE MANAGEMENT: FIELD OPERATOR

Written by

Carole A. Smith

Project Coordinated by

Mary Kellum

Developed by

The Mid-America Vocational Curriculum Consortium, Inc.

Board of Directors

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Sylvia Clark, Texas, Parliamentarian
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LANDSCAPE MANAGEMENT: FIELD OPERATOR

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FOREWORD

Landscape Management: Field Operator is the first volume of a series of instructional materials produced by the Mid-America Vocational Curriculum Consortium. This publication comprises the basic competencies necessary to be employed in a landscape management occupation. The other publications address higher level occupations in landscape management and are entitled *Landscape Management: Field Specialist* and *Landscape Management: Field Supervisor*.

The success of this publication is due, in large part, to the capabilities of the personnel who worked with its development. The technical writers have numerous years of industry as well as teaching and writing experience. Assisting them in their efforts were committee representatives who brought with them technical expertise and experience related to the classroom and to the trade. To assure that the materials would parallel the industry environment and be accepted as a transportable basic teaching tool, other organizations and industry representatives were involved in the developmental phases of the manual. Appreciation is extended to them for their valuable contributions to the manual.

This publication is designed to assist teachers in improving instruction. As this publication is used, it is hoped that the student performance will improve and that students will be better able to assume a role in their chosen occupation. Every effort has been made to make this publication readable, and by all means, usable. Three vital parts of instruction have been intentionally omitted from these publications: motivation, personalization, and localization. Those areas are left to the individual instructors who should capitalize on them. Only then will this publication really become a vital part of the teaching-learning process.

It is the sincere belief of the MAVCC staff and all those members who served on the committee that this publication will allow the students to become better prepared and more effective members of the work force. If there is anything that we can do to help this publication become more useful to you, please let us know.

Ron Mehrer, Chairman
Board of Directors
Mid-America Vocational
Curriculum Consortium

Greg Pierce
Executive Director
Mid-America Vocational
Curriculum Consortium

ACKNOWLEDGEMENTS

Appreciation is extended to those individuals who contributed their time and talent to the development of *Landscape Management: Field Operator*.

The contents of this publication were planned and reviewed by the following members of the Mid-America Vocational Curriculum Consortium landscape management committee:

Representing education

Rick Buus	Southeast Vocational Technical Institute Sioux Falls, SD
Nick Christians	Iowa State University, Department of Horticulture Ames, IA
Linda Corley	Coronado High School El Paso, TX
Lee Griffith	Department of Vocational Agriculture Education Little Rock, AR
Wayne Hefley	Iowa State University, Department of Horticulture Ames, IA
Gary Jones	Peabody High School Peabody, KS
Jim MacLean	Columbia Career Center Columbia, MO
Shirley Stephens	Chickasha High School Chickasha, OK
Paul Vitale	Slidell Vo-Tech School Slidell, LA
James Yeisley	Department of Vo-Tech Education, Agriculture Stillwater, OK

Representing industry

Mike Burnett	Oklahoma State University, Physical Plant Services Stillwater, OK
Reed Clifton	Landscape Enterprises Oklahoma City, OK
Ross Flood	Tierra Vista, Inc. Tulsa, OK
C.B. "Buck" Haas	Taylor Nursery Taylor, ND
Roger Jones	Department of Vo-Tech Education, Groundskeeping Stillwater, OK
Harold Neal	Tulsa Country Club Tulsa, OK
Steve and Deborah Newton	Classis Landscaping Maramec, OK
Steve Tanner	Autumn Gold Landscapes Denver, CO

Special appreciation is extended to **Nancy Hilley** for the original artwork and pasteup of this book.

Gratitude is expressed to the employees of the Graphics Division of the Oklahoma State Department of Vocational-Technical Education for the phototypesetting and printing of this text.

Thanks are also extended to **Mary Kellum**, MAVCC Curriculum Specialist, for her assistance with the editing of this book, as well as the coordination of the entire project.

USE OF THIS PUBLICATION

Instructional Units

Landscape Management: Field Operator contains six units of instruction. Each instructional unit includes some or all of the basic components of a unit of instruction; performance objectives, suggested activities for teachers and students, information sheets, assignment sheets, job sheets, visual aids, tests, and answers to the tests. Units are planned for more than one lesson or class period of instruction.

Careful study of each instructional unit by the teacher will help to determine:

A. The amount of material that can be covered in each class period
B. The skills which must be demonstrated

    1. Supplies needed
    2. Equipment needed
    3. Amount of practice needed
    4. Amount of class time needed for demonstrations

C. Supplementary materials such as pamphlets or filmstrips that must be ordered
D. Resource people who must be contacted

Objectives

Each unit of instruction is based on performance objectives. These objectives state the goals of the course, thus providing a sense of direction and accomplishment for the student.

Performance objectives are stated in two forms: unit objectives, stating the subject matter to be covered in a unit of instruction; and specific objectives, stating the student performance necessary to reach the unit objective.

Since the objectives of the unit provide direction for the teaching-learning process, it is important for the teacher and students to have a common understanding of the intent of the objectives. A limited number of performance terms have been used in the objectives for this curriculum to assist in promoting the effectiveness of the communication among all individuals using the materials.

Reading of the objectives by the student should be followed by a class discussion to answer any questions concerning performance requirements for each instructional unit.

Teachers should feel free to add objectives which will fit the material to the needs of the students and community. When teachers add objectives, they should remember to supply the needed information, assignment and/or job sheets, and criterion tests.

Suggested Activities for the Instructor

Each unit of instruction has a suggested activities sheet outlining steps to follow in accomplishing specific objectives. Duties of instructors will vary according to the particular unit; however, for best use of the material they should include the following: provide students with objective sheet, information sheet, assignment sheets, and job sheets; preview filmstrips, make transparencies, and arrange for resource materials and people; discuss unit and specific objectives and information sheet; give test. Teachers are encouraged to use any additional instructional activities and teaching methods to aid students in accomplishing the objectives.

Information Sheets

Information sheets provide content essential for meeting the cognitive (knowledge) objectives in the unit. The teacher will find that the information sheets serve as an excellent guide for presenting the background knowledge necessary to develop the skill specified in the unit objective.

Students should read the information sheets before the information is discussed in class. Students may take additional notes on the information sheets.

Transparency Masters

Transparency masters provide information in a special way. The students may see as well as hear the material being presented, thus reinforcing the learning process. Transparencies may present new information or they may reinforce information presented in the information sheets. They are particularly effective when identification is necessary.

Transparencies should be made and placed in the notebook where they will be immediately available for use. Transparencies direct the class's attention to the topic of discussion. They should be left on the screen only when topics shown are under discussion.

Assignment Sheets

Assignment sheets give direction to study and furnish practice for paper and pencil activities to develop the knowledge which is a necessary prerequisite to skill development. These may be given to the student for completion in class or used for homework assignments. Answer sheets are provided which may be used by the student and/or teacher for checking student progress.

Job Sheets

Job sheets are an important segment of each unit. The instructor should be able to demonstrate the skills outlined in the job sheets. Procedures outlined in the job sheets give direction to the skill being taught and allow both student and teacher to check student progress toward the accomplishment of the skill. Job sheets provide a ready outline for students to follow if they have missed a demonstration. Job sheets also furnish potential employers with a picture of the skills being taught and the performances which might reasonably be expected from a person who has had this training.

Test and Evaluation

Paper-pencil and performance tests have been constructed to measure student achievement of each objective listed in the unit of instruction. Individual test items may be pulled out and used as a short test to determine student achievement of a particular objective. This kind of testing may be used as a daily quiz and will help the teacher spot difficulties being encountered by students in their efforts to accomplish the unit objective. Test items for objectives added by the teacher should be constructed and added to the test.

Test Answers

Test answers are provided for each unit. These may be used by the teacher and/or student for checking student achievement of the objectives.

LANDSCAPE MANAGEMENT: FIELD OPERATOR

INSTRUCTIONAL/TASK ANALYSIS

RELATED INFORMATION: What the Worker Should Know (Cognitive)

JOB TRAINING: What the Worker Should Be Able to Do (Psychomotor)

UNIT I: ORIENTATION

1. Terms and definitions
2. Careers related to groundskeeping
3. Groundskeeping job opportunities
4. Groundskeeping skill levels
5. Common job tasks of groundskeeping
6. General groundskeeping working conditions
7. Sources of information about job openings
8. Principal methods of applying for a job
9. Items which may be required when applying for a job
10. Guidelines to follow when participating in a job interview
11. Attributes an employer looks for in an employee
12. Dressing for work
13. Components of a general safety program
14. How to dress safely
15. Proper handling of presticides and other hazardous materials
16. Safety procedures to follow on the job

RELATED INFORMATION: What the Worker Should Know (Cognitive)	JOB TRAINING: What the Worker Should Be Able to Do (Psychomotor)
	17. Write a resume
	18. Write a letter of application for a groundskeeping job
	19. Complete employment application form for a job as a field operator
UNIT II: HAND TOOLS	
1. Terms and definitions	
2. Considerations in choosing hand tools for particular jobs	
3. Variations of hand tool construction	
4. Characteristics of quality tools	
5. Parts of a hoe	
6. Types of hoes	
7. Parts of a rake	
8. Types of rakes	
9. Parts of a shovel	
10. Types of shovels	
11. Parts of a spade	
12. Types of spades	
13. Parts of a fork	
14. Types of forks	
15. Parts of hand pruners	
16. Types of hand pruners	
17. Parts of a bypass type lopper	

RELATED INFORMATION: What the Worker Should Know (Cognitive)	JOB TRAINING: What the Worker Should Be Able to Do (Psychomotor)
18. Types of loppers and pole pruners	
19. Types of pruning saws	
20. Types of wheelbarrows and carts	
21. Types of spreaders	
22. Specialty hand tools	
23. General procedures for maintaining hand tools	
24. Procedures for properly storing tools for the winter	
25. Techniques for sharpening tools	
26. Safety precautions to follow when using hand tools	
	27. Use hand tools properly
	28. Remove rust from tools
	29. Condition weathered wooden handles
	30. Sharpen a hoe
	31. Replace a shovel handle

UNIT III: LIGHT POWER EQUIPMENT

RELATED INFORMATION: What the Worker Should Know (Cognitive)	JOB TRAINING: What the Worker Should Be Able to Do (Psychomotor)
1. Terms and definitions	
2. General safety practices for power equipment	
3. Electric safety practices for power equipment	
4. Fuel safety practices for power equipment	
5. Light power equipment used in groundskeeping	

RELATED INFORMATION: What the Worker Should Know (Cognitive)	JOB TRAINING: What the Worker Should Be Able to Do (Psychomotor)
6. Safety practices for using string trimmers, edgers, portable blowers, and hedge shears	
7. Chain saw safety practices	
8. Mower safety practices	
9. Rotary tiller safety practices	
10. Power shredder safety practices	
11. Snowblower safety practices	
12. Generator safety practices	
13. Procedures for winterizing and storing light power equipment	
	14. Use a string trimmer
	15. Use an edger
	16. Use a walk-behind mower
	17. Remove and replace a rotary mower blade
	18. Use a vertical mower/dethatcher
	19. Use a rear-tine tiller
	20. Use a front-tine tiller

UNIT IV: WATER AND WATERING TECHNIQUES

1. Terms and definitions
2. Reasons for supplemental irrigation
3. Ways watering affects plant performance
4. Conditions that increase or decrease water requirements
5. Factors affecting water quality

RELATED INFORMATION: What the Worker Should Know (Cognitive)	JOB TRAINING: What the Worker Should Be Able to Do (Psychomotor)
6. Water conservation methods	
7. Results of improper watering techniques	
8. Methods for correcting water problems	
9. Causes and results of waterlogged soils	
10. Plant symptoms resulting from excess or deficient water	
11. Types of irrigation systems	
12. Advantages and disadvantages of using mulches	
13. Main parts of hose tubing	
14. Types of hose construction materials	
15. Uses for different diameters of hose tubing	
16. Hose couplings and repair devices	
17. Hose maintenance	
18. Types of hose-end watering devices	
19. Characteristics of hose-end watering devices	
20. General maintenance procedures of hose-end attachments	
21. General types of sprinklers	
22. Characteristics of sprinklers	
	23. Identify general plant symptoms resulting from excess or deficient water
	24. Sketch a sprinkler water pattern

RELATED INFORMATION: What the Worker Should Know (Cognitive)

JOB TRAINING: What the Worker Should Be Able to Do (Psychomotor)

25. Measure the amount of water applied by a sprinkler
26. Repair a hose coupling

UNIT V: PLANTING AND MAINTAINING PLANT BEDS

1. Terms and definitions
2. Classes of plants according to growth habits
3. Classes of plants according to landscape form and use
4. Classes of plants according to root forms
5. Characteristics of various root forms
6. Procedures for handling various plant materials
7. Techniques for planting/transplanting plant materials
8. Methods for staking plant materials
9. Rules for staking
10. Trimming and grooming practices
11. Requirements for a good mulch
12. Characteristics of mulches
13. Reasons for replacing mulch materials
14. Reasons for replacing plant materials
15. Plant a balled and burlapped tree or shrub
16. Plant a bareroot plant
17. Plant a container grown plant
18. Plant bedding plants

RELATED INFORMATION: What the Worker Should Know (Cognitive)	JOB TRAINING: What the Worker Should Be Able to Do (Psychomotor)

UNIT VI: ESTABLISHING AND MAINTAINING TURF

1. Terms and definitions
2. Two types of turfgrasses
3. Methods of turf establishment
4. Considerations for establishing turf by seeding
5. Techniques which may be used when establishing turf
6. Turfgrass care after establishment
7. Guidelines for mowing established turf
8. Advantages and disadvantages of clippings
9. Causes of thatch
10. Damage caused by thatch buildup
11. Methods of cultivating compacted soils
12. Turfgrass fertilization
13. Factors affecting fertilizer application
14. Causes and ways to prevent weed problems
15. Symptoms and ways to prevent disease problems
16. Symptoms and ways to prevent insect problems
17. Symptoms and ways to prevent nematode problems
18. Symptoms and ways to control animal pest problems

RELATED INFORMATION: What the Worker Should Know
(Cognitive)

JOB TRAINING: What the Worker Should Be Able to Do
(Psychomotor)

19. Calculate lawn areas

20. Prepare a turf planting site

21. Plant a prepared site by seeding

22. Plant a prepared site by sodding

23. Plant a prepared site by sprigging

24. Plant a prepared site by plugging

25. Plant a prepared site by stolonizing

26. Winter overseed an existing lawn

27. Remove thatch from an established lawn

LANDSCAPE MANAGEMENT: FIELD OPERATOR

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ORIENTATION
UNIT I

UNIT OBJECTIVE

After completion of this unit, the student should be able to discuss the careers and working conditions in groundskeeping, locate a job opening, make a formal application, and recognize appropriate job attitudes and attributes. Competencies will be demonstrated by completing the assignment sheets and the unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to a groundskeeping job with the correct definitions.
2. List careers related to groundskeeping.
3. List three areas of groundskeeping job opportunities.
4. Distinguish between the three groundskeeping skill levels.
5. List common job tasks of groundskeeping.
6. Name general groundskeeping working conditions.
7. Name sources of information about job openings.
8. List three principal methods of applying for a job.
9. Name items which may be required when applying for a job.
10. Select true statements concerning guidelines to follow when participating in a job interview.

OBJECTIVE SHEET

11. Select from a list attributes an employer looks for in an employee.
12. Select true statements concerning dressing for work.
13. Name the five components of a general safety program.
14. Select true statements concerning how to dress safely.
15. Complete statements concerning the proper handling of pesticides and other hazardous materials.
16. Select true statements concerning safety procedures to follow on the job.
17. Write a resumé. (Assignment Sheet #1)
18. Write a letter of application for a groundskeeping job. (Assignment Sheet #2)
19. Complete employment application form for a job as a field operator. (Assignment Sheet #3)

ORIENTATION
UNIT I

SUGGESTED ACTIVITIES

A. Obtain additional materials and/or invite resource people to class to supplement/reinforce information provided in this unit of instruction.

(NOTE: This activity should be completed prior to the teaching of this unit.)

B. Make transparencies from the transparency masters included with this unit.

(NOTE: Transparencies printed on acetate sheets are available as a set for the three publications in MAVCC's Landscape Management Series. This set may be purchased from your state curriculum lab or directly from MAVCC by writing to 1500 West Seventh, Stillwater, OK 74074 or by calling toll free 1-800-654-3988.)

C. Provide students with objective sheet.

D. Discuss unit and specific objectives.

E. Provide students with information and assignment sheets.

F. Discuss information and assignment sheets.

(NOTE: Use the transparencies to enhance the information as needed.)

G. Integrate the following activities throughout the teaching of this unit:

1. Discuss the education requirements of groundskeeping jobs and related careers.
2. Discuss educational courses which would benefit students pursuing a groundskeeping career.

   Examples: Small engines, welding, business communications, bookkeeping, electricity
3. Invite a groundskeeper manager to discuss application letters, resumes, employment application forms, and follow-up letters or calls.
4. Invite employers to discuss things they look for in a prospective employee and reasons for hiring an employee.
5. Conduct a survey of local areas for job opportunities.
6. Show examples of actual resumes and application letters.
7. Have students play the different roles of employer, receptionist, and job seeker in an interview situation.
8. Obtain copies of state, federal, and local laws which will affect groundskeeping.

SUGGESTED ACTIVITIES

9. Provide information about CPR classes or arrange for CPR classes to be taught by qualified instructors.

10. Show a first aid kit and demonstrate first aid techniques.

11. Discuss fire extinguishers and allow each student to operate one.

12. Discuss fire safety.

13. Have students discuss job practices which they think could be unsafe.

14. Obtain the location and phone number of the nearest Poison Control Center.

15. Have students list agencies and phone numbers which they feel would be necessary for minor and major emergencies.

    Example: Doctor
    Poison Control Center
    Heat-Gas or fuel Company
    Electric Company
    Police
    Hospital
    Fire Department
    Plumber

16. Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas for improvement.

H. Give test.

I. Evaluate test.

J. Reteach if necessary.

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No. 7451 — *Agricultural Pesticide Storage*
No. 7453 — *First Aid for Pesticide Poisoning*
No. 7454 — *Check Your Pesticide Labels*
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(NOTE: Similar publications may be available from other state extension services.)

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I. *Lawn and Gardening Marketing.* P.O. Box 12901, Overland Park, KS 66212.

J. *Nursery Business.* Brentwood Publications, P.O. Drawer 77, Elm Grove, WI 53122.

K. *Pacific Coast Nurseryman.* 822 South Baldwin Avenue, Box M-1, Arcadia, CA 91006.

SUGGESTED SUPPLEMENTAL RESOURCES

L. *Pest Control Technology*. 2803 Bridge Avenue, Cleveland, OH 44113.

M. *Trees Magazine*. 7621 Lewis Road, Olmstead Falls, OH 44138.

N. *Western Landscaping News*. P.O. Box 19531, Irvine, CA 92713.

O. *Garden Supply Retailer*. P.O. Box 67, Minneapolis, MN 55440.

P. *Golf Business*. (The Magazine for Golf Course Management/Turf Maintenance) 9800 Detroit Avenue, Cleveland, OH 44102.

Q. *Florists' Review*. Florists' Publishing Company, 310 South Michigan Avenue, Chicago, IL 60604.

R. *Grounds Maintenance*. Intertec Publishing Corporation, 922 Quivera Road, Overland Park, KS 66215.

CHEMICAL SUPPLIERS

A. Chacon Chemical Corporation
5245 Chakemco Street
South Gate, California 90280
(Ask for student horticulture guide)

B. Chemagro
Larry Fricker Company
12971 Newport Avenue
P.O. Box 451
Tustin, California 92680

C. Chevron Chemical Company
Ortho Division
200 Bush Street
San Francisco, California 94120
(Ask for *Ortho Lawn and Garden Book* for student use)

D. Geigy Agricultural Chemicals
Geigy Chemical Corporation
Saw Mill River Road
Ardsley, New York
(Ask for insect and weed charts; 800-334-9481)

E. Northern California Occidental Chemical Company
Consumer Products Division
Main Office, P.O. Box 198
Lathron, California 95330
(Ask for *Best Garden and Lawn* catalog)

SUGGESTED SUPPLEMENTAL RESOURCES

F. Southern California Occidental Chemical Company
Consumer Products Division
1100 West Foothill Boulevard
Azusa, California 91702
(Ask for *Best Garden and Lawn* catalog)

G. Sierra Chemical Company
P.O. Box 275
Newark, California 94560
(Osmocote suppliers)

H. Stauffer Chemical Company
99 South Cottonwood Road
Bakersfield, California 93307

ORIENTATION
UNIT I

INFORMATION SHEET

I. **Terms and definitions**

A. Application form — Printed form on which job applicants record information about their personal history, job history, education, and references

B. Award — Recognition received for outstanding achievement

C. Blind ad — Classified advertising that does not identify the advertiser

(NOTE: Applicant is asked to send a letter of application and resume to a post office box number or to call a certain number.)

D. Employment agency — Organization designed to help individuals find employment

E. Employment/situation wanted ad — Classified advertisement placed by individuals seeking employment and telling what their qualifications are

F. Equal opportunity employer (EOE) — Employer who is making a special effort to assure that no form of discrimination is practiced

Examples: Age, sex, race, creed

G. Extracurricular activities — Clubs, organizations, and social or church groups in which one participates

Examples: Horticulture club, FFA, student chapter of American Association of Nurserymen (AAN)

H. Fair Labor Standards Act — Established to insure equal pay for equal work on jobs that require equal skills and responsibilities

1. Establishes standards for payment of overtime work

2. Establishes a minimum wage for all workers

I. Fringe benefits — Extras provided by an employer, such as paid vacations, sick leave, and insurance protection

J. Help wanted ad — Classified advertisement telling what kind of job is available and what qualifications are required

K. Interview — Meeting of employer and job applicants for purpose of evaluation and questioning

INFORMATION SHEET

L. Legible - Capable of being read; clear

M. Occupational Safety and Health Act — Laws designed to assure safe and healthful working conditions

N. Pesticide application certification — Regulates the use of toxic pesticides by requiring applicators to prove their knowledge of pesticide use and safety; periodic recertification is required

(NOTE: This is a result of the Environmental Pesticide Control Act.)

O. Qualifications — Experience, education, and physical characteristics which suit a person to a job

P. Resumé — Brief, typed summary of one's qualifications and experience that is used in applying for a job

Q. Social Security — A system which requires a percentage of an employee's salary to be withheld and a matching amount paid by the employer to provide financial assistance to persons after their retirement

R. Transcript — A printed copy of courses completed and grades earned while attending a school

S. Unemployment compensation — A system which provides financial protection for workers who loose their jobs for reasons other than quitting

T. Vocational preparation — Any vocational courses and skills one has learned in school or through work experience

U. Workmen's compensation insurance — A system which provides compensation to employees injured on the job

II. Careers related to groundskeeping

A. Landscape architect

1. Plans and develops the outdoor (usually large) spaces surrounding buildings.
2. May require college education, certification, and/or licensing.

B. Landscape designer

1. Designs landscapes primarily for residential or small commercial areas.
2. Usually does not require licensing.

INFORMATION SHEET

C. Landscape contractor

1. Installs and constructs landscapes according to written contracts and approved designs.
2. Obtains required plant and construction materials.
3. May offer maintenance and design services.
4. May rely on subcontractors for outside services.

D. Nurseryman (also called grower, retailer, or wholesaler)

1. Primarily sells plant materials (retail and wholesale).
2. May grow their own plant materials.
3. Requires large inventory of plant materials.
4. May offer design, installation, and maintenance services.
5. May rely on subcontractors for outside services.

E. Greenskeeper — Combines ground maintenance tasks with specialized requirements of golf course turf.

F. Specialty careers

1. Pesticide applicators
2. Fertilizer applicators
3. Turf installation specialists
4. Irrigation specialists
5. Arborists

III. Areas of groundskeeping job opportunities

A. Governmental groundskeeping

1. Employee of federal, state, county, or city government
2. Requires several workers and specialized equipment to maintain the government grounds

   Examples: Parks, fairgrounds, school grounds, freeways

INFORMATION SHEET

B. Residential groundskeeping

1. Requires fewer workers and equipment
2. Principal services are mowing, trimming, and trash removal
3. Self-employment or hired employment (full or part time)

C. Industrial or commercial groundskeeping

1. Businesses employ maintenance service or hire permanent groundskeepers
2. Requires specialized crews of workers and large equipment inventories
3. May require skills in landscape design and installation, as well as maintenance

   Examples: Condominiums, shopping centers, country clubs, industrial complexes

   (NOTE: Many maintenance firms service both residential and commercial customers.)

IV. **Groundskeeping skill levels** (Transparency 1)

A. Field operator

1. Understands basic horticulture principles and practices
2. Performs basic landscape maintenance services
3. Operates and assists in the maintenance of equipment
4. Interacts with other workers usually as part of a crew
5. Understands job is flexible and will vary depending on tasks to be performed
6. Is observant and safety conscious; notifies field supervisor of any changes that may indicate problems.
7. Performs other tasks assigned by the field supervisor

B. Field specialist

1. Possesses skills of a field operator
2. Calculates fertilizer and seeding rates
3. Monitors irrigation systems

INFORMATION SHEET

4. Performs basic record keeping tasks
5. Applies pesticides
6. Guides the work of the field operator
7. Identifies common plant pests and diseases
8. Performs other tasks assigned by the field supervisor

C. Field supervisor

1. Possesses skills of a field operator and field specialist
2. Assigns daily tasks for the crews
3. Instructs workers on proper methods for carrying out job tasks
4. Ensures that equipment is in safe, working order
5. Manages employees
6. Deals with the public

   Examples: Customers, wholesalers, growers, material suppliers

7. Manages records

   Examples: Accident reports, schedules, time sheets, job sheets, inventory records

8. Calculates and schedules pesticide application
9. Supervises irrigation system installation
10. Is aware of resource people to identify and solve new problems
11. Performs other tasks assigned by the owner and/or manager

    Examples: Cost estimates, hiring and firing employees

V. Common job tasks of groundskeeping

A. Mowing

B. Pruning, trimming, grooming

C. Pest identification and control

INFORMATION SHEET

- D. Planting and replacing plant materials
- E. Cultivation
- F. Maintenance of nonplant structures

  Examples: Edging, walks, pools
- G. Irrigation installation and application
- H. Fertilizer application
- I. Mulching and composting
- J. Thatch removal
- K. Installing new and reseeding existing turf
- L. Snow removal
- M. Equipment maintenance and repair

VI. **General groundskeeping working conditions**

- A. Work out of doors
- B. Operate away from the office for several hours at a time
- C. Work alone or as a crew member
- D. Operate out of a service vehicle
- E. Involves light to heavy manual labor

  Examples: Digging, lifting, carrying plant materials
- F. Job changes with the seasons

  (NOTE: Because labor demands are greater during the growing season, employment may be seasonal.)

VII. **Sources of information about job openings**

- A. Classified ads
  - 1. Newspapers
  - 2. Trade magazines

    Examples: *Landscape Architect, American Nurseryman, Grounds Maintenance*

INFORMATION SHEET

- B. Current workers in groundskeeping industry
  - 1. Owners, managers, and other employees of small businesses
  - 2. Representatives at trade fairs
  - 3. Participants of workshops or short courses
- C. School officials
  - 1. Teacher
  - 2. Counselor
  - 3. Principal
  - 4. Placement officer
- D. Employment offices
  - 1. State and federal labor offices
  - 2. Private "personnel offices"

    (NOTE: Most private employment agencies charge a fee.)
- E. Co-operative extension service personnel
- F. Local labor union business offices
- G. Friends and family members

VIII. **Principal methods of applying for a job** (Assignment Sheets #1, #2, and #3)

- A. By letter

  (NOTE: A resume and school transcripts usually are sent with an application letter.)
- B. By telephone

  (NOTE: Applying by telephone is really a request for an in-person interview. Rarely will an employer hire a worker sight unseen.)
- C. In person

  (NOTE: Always be prepared to provide a resumé, transcripts, or other needed information about your qualifications.)

INFORMATION SHEET

IX. Items which may be required when applying for a job

- A. Resumé (Assignment Sheet #1)
- B. Letter of application (Assignment Sheet #2)
- C. Application form (Assignment Sheet #3)

  (NOTE: Letter(s) of recommendation may also be used. If so, they should be attached to the application form.)

- D. Transcript(s)
- E. Follow-up letter or phone call

X. Guidelines to follow when participating in a job interview

- A. Prepare for the interview.
  - 1. Wear appropriate clothing. (Transparency 2)
    - a. Dress better for the interview than you would for a day on the job.
    - b. Choose well coordinated clothing and avoid too formal as well as too casual clothes.
  - 2. Be well-groomed, clean, and neat.
  - 3. Organize the materials you need to take to the interview in a notebook or briefcase. Take two ink pens, two pencils, copies of your resumé, and all information concerning social security number, references, names and addresses, dates employed, and dates you attended school. Two forms of identification are required to comply with federal immigration laws.
  - 4. Go alone. Do not take family or friends.
  - 5. Do not be late.
  - 6. Find out facts about the interviewer and business ahead of time.
    - a. Name and title
    - b. Type of business
    - c. Services offered

INFORMATION SHEET

B. Meet the receptionist.

1. Smile.
2. Introduce yourself, stating that you have an appointment.

   Example: "Good morning, I am John Clark and am applying for the job as field operator. I have a 9:30 appointment with Mr. Smith."

3. Follow the receptionist's instructions.
4. Wait patiently.

C. Conduct yourself appropriately during the interview.

1. Smile warmly.
2. Call the interviewer by Mr. or Mrs. (last name).
3. Introduce yourself, stating the position for which you are applying.
4. Shake hands firmly if it is offered.
5. Be seated only at the interviewer's invitation.
6. Sit still or stand erect.
   a. If standing, do not lean against the wall or restlessly shift your weight from one foot to the other.
   b. If sitting, avoid squirming in your chair, finger tapping, or swinging a crossed leg.
7. Do not smoke, chew gum or tobacco, or eat candy.
8. Do not place personal items on the interviewer's desk.
9. Look alert; look interested and enthusiastic.

D. Answer the interview questions appropriately.

1. Let the interviewer take the lead in the conversation.
2. Do not interrupt.

INFORMATION SHEET

3. Express yourself clearly and distinctly.
    - a. Think about your answer before speaking.
    - b. Use proper grammar, avoiding slang.
    - c. Do not swear.
    - d. Do not giggle.
4. Look directly at the interviewer.
5. Be prepared to explain yes and no answers.
6. Do not try to flatter the interviewer.
7. Do not talk about personal problems.
8. Have resumé and other information available for reference.
9. Answer all questions honestly.

    Examples: "The thing I liked least about my last job was that I was on the night shift and couldn't get changed. I really wanted to be home with my family at night."

    "Truthfully, my relationship with my supervisor could have been better. We seemed to have a personality conflict and never became fond of each other. However, we did manage to work together. This was my first experience like that, and I hope it doesn't happen again."

10. Be positive.
    - a. Give positive answers to unfavorable questions.

        Examples: *Interviewer:* "Your work experience doesn't seem to relate specifically to this job. Why do you feel qualified to fill this position?"

        Applicant: "I understand your concern. However, my job experience is broad enough to permit me to work into this particular situation. I have done work similar to this job and I think my general work record is good enough to convince you that I would be a good employee. I would be willing to receive additional training."

INFORMATION SHEET

b. Find a true, positive statement about your reasons for leaving previous jobs, even if you were fired. Do not blame your former employer.

Examples: "I was dismissed, but I learned from my mistakes."

"I left because they did not need as many employees during the slow season."

c. Try to mention your best qualities in relation to something concrete.

Example: "I earned 75 percent of my expenses while going to school" is better than "I am a hard worker and want to get ahead."

11. Show interest in the business; ask questions.

Examples: *Incorrect:* "Listen, I need to know if you have any benefits."

Incorrect: "Now that you've questioned me, there are a few things that I want to know before I decide if I want to work for you."

Correct: "I wonder if you could give me some information about the benefits available to employees?"

E. Close the interview appropriately.

1. Watch for signs that the interview is over, such as the interviewer shuffling papers and moving around in chair.

2. Ask "May I say one thing more?" or "Would you be interested in ...?" if the interview seems to be ending before all important selling points have been made.

3. Thank interviewer for his/her time.

Example: "I've enjoyed talking to you, Mr. Smith. Thank you for your time and consideration. I'm excited about this job and do hope I'm hired. Can you tell me when the position will be filled and how the applicants will be notified? (Answer) Please let me know if you need any additional information."

4. Learn from every situation even if the interviewer does not offer the position.

F. Follow up the interview — Write thank you letter, call, or visit again to express interest in the job and appreciation for the opportunity to interview.

INFORMATION SHEET

XI. Attributes an employer looks for in an employee

A. Enthusiasm and interest

(NOTE: This includes taking pride in your work and being willing to do your share of the work and more when needed.)

B. Dedication and dependability

(NOTE: This involves good work habits which include regular attendance, being on time, and giving 8 hours of work for 8 hours of pay.)

C. Alertness, quickness of mind

(NOTE: You should always be on the lookout for unsafe situations that could injure workers or damage property. You should also look for more efficient working practices or conditions that could indicate problems such as diseased plants.)

D. Honesty and integrity

(NOTE: Employees should give truthful information both to customers and to their employer. They should never steal or allow others to steal the employer's or customer's property.)

E. Desire to work

F. Ability to work with others, to follow orders, and to comply with company policies

Examples: Prohibited use of loud radios, following company dress codes

G. Desire to improve oneself

(NOTE: Good employees always look for ways to increase their knowledge. This benefits both the employer and employee.)

H. Neat, clean appearance

I. No evidence of drug or alcohol use affecting job performance

XII. Dressing for work

(NOTE: Remember, you are dressing for the approval of your customers and employer.)

A. Wear clothing that fits properly, not too small or too large.

INFORMATION SHEET

B. Wear company uniforms if required.

1. Wear the complete outfit required, rather than trying to adapt it to fit your own personal "look" or "style".
2. Replace items that have faded company names or symbols (logos).
3. Replace "t-shirts" which are stretched out of shape, even if they do not have holes worn through.
4. Do not wear clothing with inappropriate slogans or pictures.

C. Wear neat, pressed, and clean clothes.

1. Select clothing made of washable and durable materials.
2. Replace clothing as it becomes worn.
3. Wash clothing regularly even if it doesn't look soiled.

   (NOTE: Perspiration causes offensive odors.)

D. Wear shirts with short or long sleeves. Tank tops and mesh shirts are inappropriate for work.

E. Wear long pants. Shorts and cutoffs should not be worn to work.

F. Wear durable, comfortable shoes.

1. Select shoes which protect your ankles and toes.
2. Select shoes which can repel moisture and heavy soil.

   (NOTE: Specialized shoes can be worn for certain jobs such as handling chemicals or watering plant materials.)

3. Do not wear sandals.

G. Practice good personal hygiene.

1. Bathe often (at least daily) and wear clean clothes to prevent offensive body odors.
2. Brush your teeth regularly to prevent bad breath.

   (NOTE: Remember, you will be in contact with co-workers and customers throughout the day. Garlic, onions, cigarettes, coffee, and other foods and drinks can cause bad breath.)

INFORMATION SHEET

H. Keep your hair clean and neat.

I. Wear specialized clothing when needed.

  1. Hats and sunglasses can provide relief from hot sun and winds.

  2. Insulated clothing can protect the worker from uncomfortably cold temperatures.

     (NOTE: Weather conditions which favor plant materials are often uncomfortable for workers. Plan ahead and dress for the job.)

  3. Gloves can protect hands and make jobs easier.

XIII. Components of a general safety program

A. First aid techniques (Handout #2)

B. Dressing safely

C. Proper use of equipment

(NOTE: This will be discussed in Units II and III.)

D. Proper handling of pesticides and other hazardous materials

E. Proper safety attitudes

XIV. How to dress safely

A. Wear gloves to reduce frequency and extent of hand injuries.

B. Wear hats, long pants, and comfortably-fitting shirts to provide protection from hot temperatures, splashing materials, and rough and sharp objects.

C. Wear sturdy shoes to support ankles and provide some protection from heavy or sharp objects.

D. Wear hair short or secure long hair to keep it from catching in equipment or reducing visibility.

E. Wear special equipment required for each piece of equipment being operated.

Example: Wear goggles or safety glasses when working around flying objects (wood chips, rocks) or splashing materials (liquid pesticides).

INFORMATION SHEET

XV. Proper handling of pesticides and other hazardous materials

(NOTE: Additional information concerning pesticides and hazardous materials may be obtained from guides for commercial/noncommercial applicators, pesticide workshops, chemical manufacturing companies, and extension services. *States require workers dealing with pesticides to be certified, licensed, and/or closely supervised.*)

A. Store hazardous materials in a separate room or area that is safe, well-lighted, insulated, fireproof, well-ventilated, and clearly marked as storage.

B. Store hazardous materials in tightly closed, clearly marked, and permanently labeled containers.

C. Wear protective clothing when handling chemicals and hazardous materials.

1. Chemical resistant gloves
2. Chemical resistant shoes

   (CAUTION: Cloth, leather, and some synthetic materials can retain chemicals and cause them to be held close to the skin. For example, leather boots can retain spilled chemicals causing them to be absorbed through the skin of the foot.)

3. Protective goggles
4. Respirators
5. Disposable suits and aprons

D. Wash carefully after handling any pesticide or hazardous materials.

(CAUTION: Do not smoke or eat while handling any chemicals. Chemical poisoning can cause serious illness and even death.)

E. Know the symptoms and signs of pesticide poisoning.

1. Nausea, diarrhea
2. Headache, dizziness, fatigue
3. Redness, blisters, rash on skin
4. Swelling and stinging sensation in eyes, nose, mouth, or throat
5. "Flu" or "hangover" type symptoms

INFORMATION SHEET

6. Irritable and unnatural behavior

(NOTE: ONLY A PHYSICIAN CAN DIAGNOSE PESTICIDE POISONING. Seek professional help if poisoning is suspected. Pesticides can KILL.)

F. Know how to contact the poison control center in the area.

(NOTE: The location of the nearest poison control center may be obtained from the state extension service.)

- The closest poison control center for my area is ______________________ ____.
- The phone number is ______________________________.

G. Handle spills promptly and correctly.

1. Immediately notify supervisor if possible.
2. Remove contaminated clothing.
3. Wash thoroughly.
4. Clean up spill with correct material.

(NOTE: Check label, contact chemical manufacturer or CHEMTREC at 1-800-424-9300 for clean up information.)

XVI. Safety procedures to follow on the job

A. Operate equipment only after carefully studying operating instructions.

(NOTE: Always review operating instructions. Never assume you can "figure it out.")

B. Review safe operating procedures for equipment to be used.

C. Always pick up loose objects such as wire, string, nails, and paper.

D. Return tools to the proper storage area, even if you did not use them.

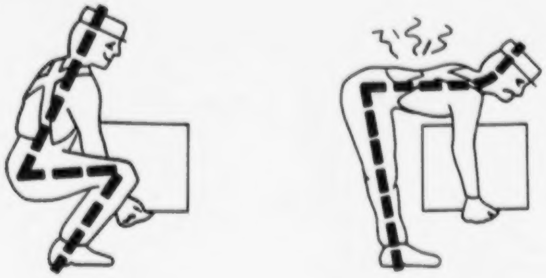
E. Complete heavier, more difficult jobs early in the day.

INFORMATION SHEET

F. Use proper lifting methods.

1. Keep the back straight and lift with the leg muscles, not the back muscles.

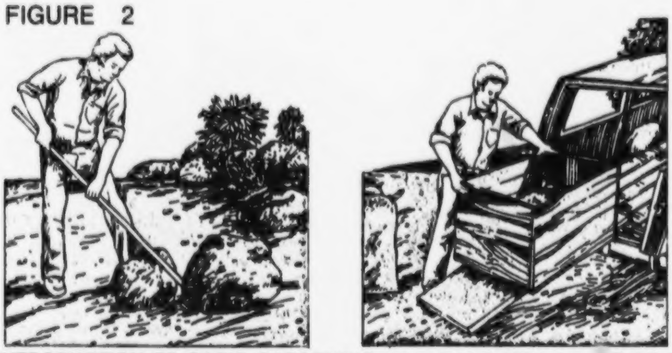
FIGURE 1



LIFT THIS WAY **NOT THIS WAY**

2. When lifting heavy objects, get help or use ramps, pry bars, hoists, or carts.

FIGURE 2



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G. Always check loads and equipment instead of assuming someone else has checked it.

H. Always check the position of co-workers, customers, and structures before moving loads and equipment.

I. Seriously participate in safety programs and practice drills.

J. Know the location of the first aid kit, emergency aid telephone numbers, fire extinguishers, and exits.

K. When a fire is discovered, evacuate everyone from the area; THEN determine if it is safe to attempt to fight the fire with a portable fire extinguisher.

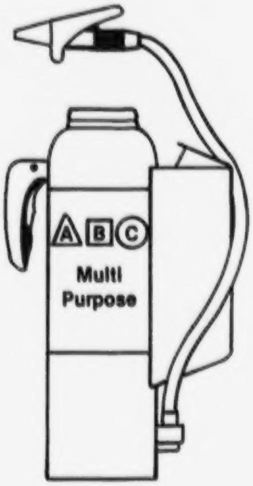
INFORMATION SHEET

L. Use the correct type of fire extinguisher for the type of burning material.

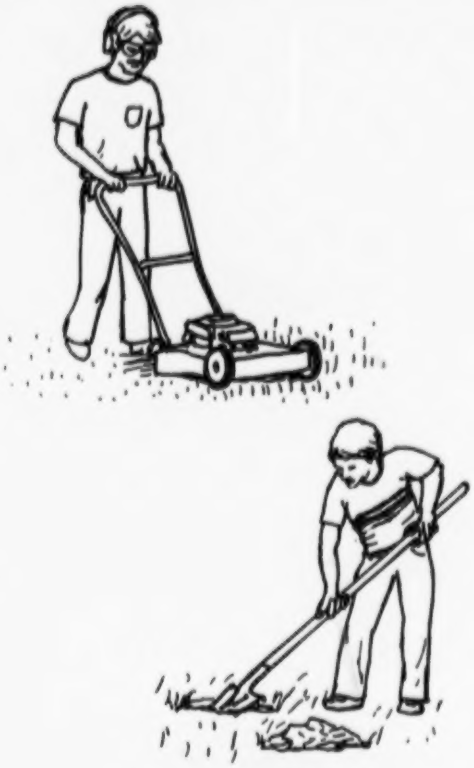
1. Class **A** Fires — Wood, paper, cloth, hay, and straw
2. Class **B** Fires — Flammable liquids (gasoline, kerosene, etc.)
   — Flammable gases (propane, LPG, etc.)
   — Oils, greases, and synthetic products
3. Class **C** Fires — Class A or B fires which are electrically energized
   (Electrical wiring, electric motors.)

(NOTE: The fire extinguisher should be clearly marked to indicate the type of fire it will extinguish. Many will extinguish more than one type of burning material.)

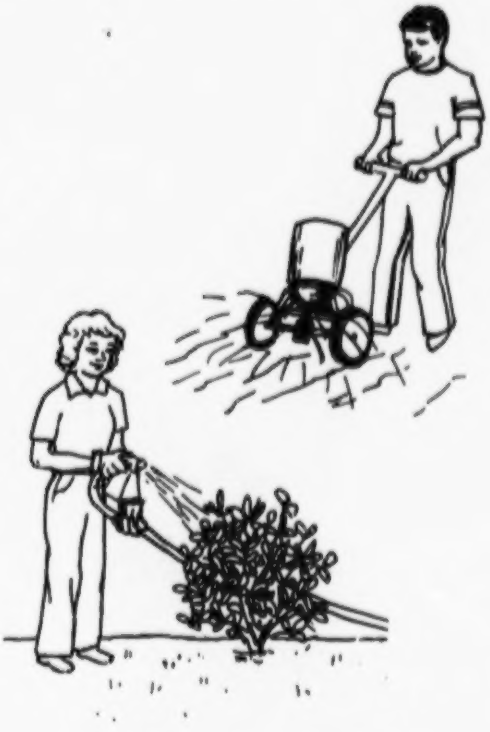
FIGURE 3



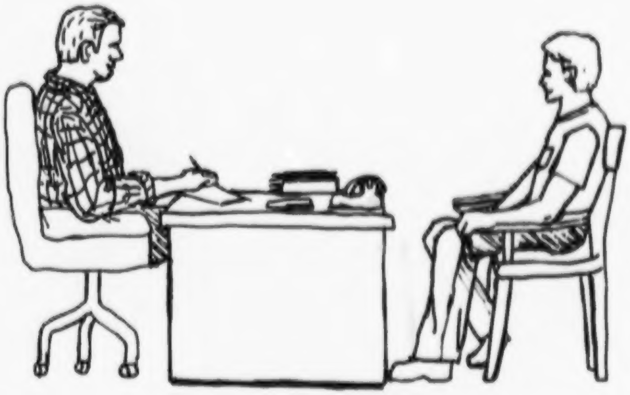
Groundskeeping Skill Levels



Field Operator

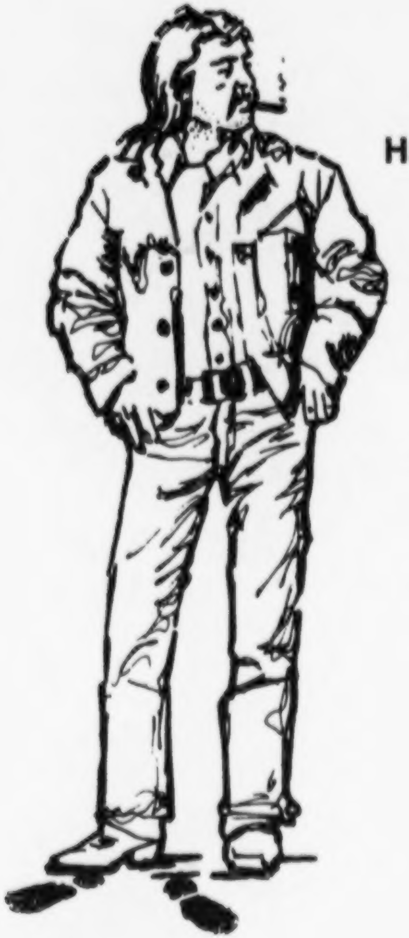


Field Specialist



Field Supervisor

Appropriate Dress

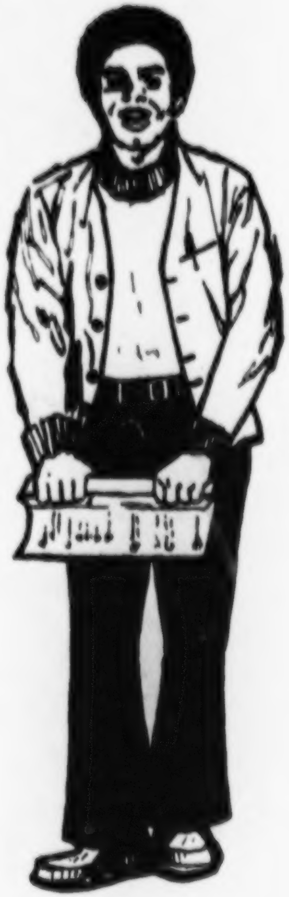


Hair Neatly Trimmed and Combed?

Well-Groomed?

Conservative and Coordinated Clothing?

Shoes in Good Repair?



ORIENTATION
UNIT I

HANDOUT #1 — COMPARE JOB OPPORTUNITIES

When you are offered a job or are changing jobs, there are many factors to weigh before taking the position. Some of these include:

1. What is your take-home pay?
2. What are the benefits which accompany the job?
3. How much will it cost to actually be at work each day?
4. Would the job be satisfying to you?
5. How would the job meet your needs and aspirations?
6. Is the job seasonal or year-round?

WHAT'S MY TAKE-HOME PAY?

Salaries and wages are often quoted by employers on gross earnings. Gross earnings are used because tax deductions vary due to the number of dependents, the amount of earnings, and other information.

Optional benefits and deductions offered by an employer also differ. It is generally advisable to ask what programs are available for enrollment as these can affect the actual money you receive on pay day.

WHAT OTHER BENEFITS DO I GET FROM THIS JOB?

Some benefits associated with working are not always visible. Often some of these overlooked benefits are paid for in part by your employer. At the time of the interview or when considering a position ask about:

Employer's contributions for your protection which may include:

1. Health insurance
2. Unemployment compensation
3. Clothing and safety garments
4. Medical facilities and health tests
5. Pensions
6. Travel insurance (covering mishaps when traveling on business)
7. Educational programs or reimbursement for courses related to job
8. Sick leave with pay
9. Paid vacations and holidays

HANDOUT #1

WHAT WILL IT COST TO WORK AT THIS JOB?

Frequently, we often overlook the costs which are associated with being employed. It may be of value to calculate estimated weekly expenses before you make a decision about a job.

Estimate weekly expenses for:

Transportation (parking, bus fares, gasoline)	$______	Child care for working parent	$______
Lunches (or cost of food eaten away from home, including soft drinks and coffee)	$______	Special uniforms, materials, or equipment for job	$______
		Other	$______
Clothing (including cleaning)	$______	TOTAL	$______

WHAT IS IMPORTANT TO ME IN A JOB?

Take-home pay and benefits may be only part of what you want from a job. Think through other things you consider important in a job.

What are some of the most rewarding things you've felt about any job you've ever had?

1. ______________________________
2. ______________________________
3. ______________________________

How might you rate these in order of what's important to you?

______ Job security (little chance you'll be released from the job)

______ Opportunity for advancement

______ Recognition for your work

______ Good wages

______ Opportunity to learn and use your ideas

______ Flexible working hours

______ Long vacations

______ Pleasant working conditions

______ Interesting work

______ Friendly co-workers

______ Travel

______ Other, such as ______________________________

HANDOUT #1

ARE YOU READY TO DECIDE????

Take all the information you have gathered and summarize it below and on the next page to reach a decision about whether you want the job or not.

1. Would the job be satisfying to you? Why/why not?

   ____

   ____

   ____

2. What are the benefits which accompany the job?

   ____

   ____

   ____

3. How much will it cost to actually be at work each day?

   ____

   ____

   ____

4. How would the job meet your needs and aspirations?

   ____

   ____

   ____

5. I estimate my take-home pay to be $ __________ .
6. I estimate my expenses related to working to be $ __________ .
7. I would most enjoy the following about this job: ______________________________

   ____

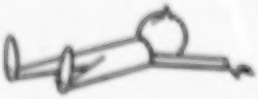
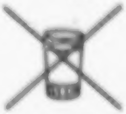
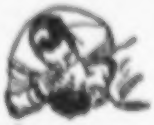
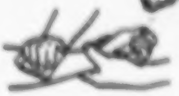
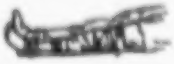
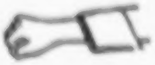
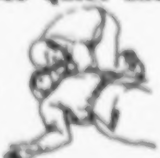
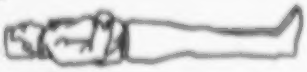
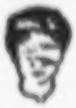
   ____

8. I estimate my job benefits to be worth $ __________ .

ORIENTATION
UNIT I

HANDOUT #2 — GENERAL DIRECTIONS FOR GIVING FIRST AID

American Red Cross

Keep the injured person lying down.  **Do not give liquids to an unconscious person.**  **Restart breathing with mouth-to-mouth artificial respiration.**  **Control bleeding by pressing on the wound.**  **Dilute swallowed poisons** **and call the Poison Control Center. Keep broken bones from moving.**  **Cover burns with thick layers of cloth.**  **Keep heart-attack cases quiet and give cardiopulmonary resuscitation (CPR) if it is necessary**  **and if you have been trained. Keep a fainting victim lying flat.**  **For eye injuries, pad and bandage both eyes.**  **Always call a doctor.**

For more information about these and other lifesaving techniques, contact your Red Cross chapter.

ORIENTATION
UNIT I

ASSIGNMENT SHEET #1 — WRITE A RESUMÉ

NAME ____________________ SCORE ____________________

Directions: Write a resumé using accurate facts about yourself. Use the information below and the sample resumé included in this assignment sheet as guides. A good resumé should immediately give prospective employers a brief summary of your accomplishments, educational background, work experience, skills, and job objective. It is not necessary to use the exact wording and outline form used on the sample resumé, but it is necessary that your resumé be neat and balanced and contain all the information which might help you get a job. Keep a current copy of the resumé and use it to apply for jobs.

1. Inspect several resumé formats and choose one that best fits your needs or use the example included in this assignment sheet as a guide.
2. Type your resumé on 8½ x 11 inch white paper. Try not to exceed two pages.
3. Keep resumé error free.

   (NOTE: Many employers will not consider persons who have resumés that include misspelled words and typographical errors.)
4. Use outline form.
5. Put your name prominently at the top in the upper left-hand corner. Beneath name, give full street address, city, state, zip code, telephone number with area code, and a number where messages can be accepted.
6. Under Personal Data include birthdate, height, weight, health, and marital status. Do not include religious and political affiliations.
7. Describe your job objective or career goal briefly.
8. Describe your educational background giving names of schools, dates of enrollment, and diploma or degrees received.
9. List related subjects studied. Include grade averages if favorable.

   (NOTE: Official transcripts may be required by some employers.)
10. List student activities and awards.
11. List hobbies and extracurricular activities if they are relevant.
12. List your past employment starting with your most recent job. Include name of firm, mailing address, job title, starting and ending dates of employment, name of immediate supervisor, and phone number.

ASSIGNMENT SHEET #1

13. List duties of your last job.

    (NOTE: Concentrate on skills you have used. Let employer know what you can do. Remember, you have to prove your value to the business, especially if you have little experience.)

14. List three persons as character references. Include complete mailing addresses and phone numbers.

    (NOTE: Ask permission before you use anyone as a reference.)

15. List one or more jobs or work references including people that you have actually worked for.

    (NOTE: Avoid listing relatives as a reference unless you have actually worked for them on a salary basis.)

16. Write "Confidential" at the top of the resumé if you don't want your current employer to know you are looking for other employment.

17. Proofread your resumé carefully and retype if necessary. Reproduce several copies on white bond paper.

    (NOTE: Your resumé's physical appearance is VERY IMPORTANT. Avoid using ditto or carbon copies. Be sure to proofread the printer's work. Always bring extra copies to the interview. Leave one copy of resumé with interviewer and use one as a reference when filling out the application form. You should also mail one resumé with your letter of application.)

ASSIGNMENT SHEET #1

SAMPLE RESUMÉ

RESUMÉ
JOHN CLARK

ADDRESS: 774 E. Adams Street
YourTown, YourState 77704
(405) 555-7779

PERSONAL DATA:

Age: 18
Birthdate: Jan. 21, 1969
Height: 5'7"
Weight: 160 lbs.

Health: Excellent
Marital Status: Single
Social Security Number: 000-00-0000

JOB OBJECTIVE:

Groundskeeper

ULTIMATE GOAL:

Professional Horticulturist

EDUCATION:

AnyTown High School, AnyTown, YourState 1987-88

Progress Vo-Tech, Progressville, YourState 1988
Certificate: Horticulture, Four Semesters
Grade Average: 3.5 on a 4.0 scale

RELATED SUBJECTS STUDIES:

High School

Algebra — 2 semesters
Geometry — 1 semester
Vocational Agriculture — 1 semester
Welding — 1 semester

Vo-Tech School

Basic Horticulture — 2 semesters
Landscape Management I — 1 semester
Landscape Management II — 1 semester

STUDENT ACTIVITIES:

Vice President, Senior Class
President, Horticulture Club
Treasurer, Baptist Youth Fellowship Organization
Landscape Construction Contest, Second Place State, Fifth Place National

ASSIGNMENT SHEET #1

WORK EXPERIENCE:

Name: Garden Path Nursery
714 E. Maple Ave.
YourTown, YourState 77704
(405) 555-2000

Job Title: Nursery Worker

Dates: June 1, 1988 to Aug. 15, 1988

Supervisor: Mr. John Ames

Duties: Liner Propagation
Watering Plants
Delivery and Pick-up
Clean up office and grounds

Name: Bloomtime Florist
612 W. Oak
YourTown, YourState 77704
(405) 555-7212

Dates: Aug. 30, 1988 to Present

Supervisor: Mr. Bill Bates

Duties: Delivery

CHARACTER REFERENCES:

1. Mr. Sammy Davis (405) 555-2552
   Vocational Horticulture Instructor
   Progress Vo-Tech
   Progressville, YourState 77703

2. Mr. John Hammer (405) 555-3333
   Friend and Neighbor
   772 E. Adams Street
   YourTown, YourState 77704

3. Mrs. Jerri Smith (405) 555-1000
   Youth Director, Parkview Baptist Church
   711 Fellowship Circle
   AnyTown, YourState 77702

WORK REFERENCE: (with permission)

Mr. Bill Bates (405) 555-7212
Florist
Bloomtime Florist
612 W. Oak
YourTown, YourState 77704

ORIENTATION
UNIT I

ASSIGNMENT SHEET #2 — WRITE A LETTER OF APPLICATION FOR A GROUNDSKEEPING JOB

NAME ______________________ SCORE ______________________

Directions: Write an application letter to accompany the resumé you prepared in Assignment Sheet #1. Use the following information and the sample letter as a guide. This application letter is a sales technique to tell the employer how your abilities will be useful to the business. The letter should specify your qualifications while the resumé gives general background information.

(NOTE: If you cannot type, it is recommended that you locate someone to type your letters for you. Make sure you have a good typewriter available.)

1. Use acceptable form and appearance.
    a. Type neatly and accurately.
    b. Write on only one side of the paper.
    c. Avoid smudges and typographical errors.
    d. Use 8½" x 11" white bond paper.

       (NOTE: Do not use personal or fancy paper.)
    e. Spell, capitalize, and punctuate correctly.
    f. Include employer's full name, title, and address.
    g. Include your full name and address with zip code on the letter.
    h. Retain a copy for your reference.
2. Include proper information.
    a. Write to a specific person.

       (NOTE: Find out the name of the personnel manager/employer you want to reach and the correct title. When in doubt, write to the top person who will refer your resume to the right party. Use TO WHOM IT MAY CONCERN if answering a blind ad.)
    b. Avoid excessive use of the pronoun "I".

ASSIGNMENT SHEET #2

c. Be brief; do not repeat information in the resumé.

   1) State the position for which you are applying.

   2) Avoid needless details.

d. State reason for interest in job.

   (NOTE: Employers look for people who look for future advancement opportunities rather than just a paycheck.)

e. Refer briefly to the main points in the attached resumé.

f. Mention that persons listed on the resumé have given their permission to serve as references.

g. Request interview at employer's convenience.

   1) Tell where you can be reached.

   2) Enclose self-addressed envelope and resumé.

   3) Say you will phone next week.

3. Be original in your approach — Attract attention in opening paragraph.

   Example:

   Dear Ms. Owner:

   Mr. Co-worker informed me that you are in need of a qualified field operator. I believe that my experience and training have taught me how to handle these duties efficiently and accurately.

4. End the letter properly.

   (NOTE: Sincerely yours or Very truly yours is appropriate.)

5. Use permanent address for the return address and make sure to include the current date.

6. Staple letter to resumé as it may be circulated to several departments and otherwise become detached.

7. Follow up and phone for an appointment a week later.

8. Keep in touch regarding possible openings now and in the future.

   (NOTE: The "job hunt" may take several weeks or even months! It's important to keep your contacts alive without being a nuisance.)

ASSIGNMENT SHEET #2

SAMPLE LETTER OF APPLICATION

774 E. Adams Street
YourTown, YourState 77704
October 15, 1988

Mr. John Jones
Personnel Director
MAVCC Nursery
YourTown, YourState 77704

Dear Mr. Jones:

Please consider me for the field operator job that you have advertised in the *Daily Chronicle*.

The skills I have learned in my vocational horticulture courses should qualify me for this job. I have had experience in all of the basic skills required by the landscape management field, including safe use of hand tools and light power equipment. A more complete description of my qualifications is given in the enclosed resumé.

I would appreciate the opportunity to come and talk over this job opportunity at your convenience. I can be reached by telephone at 405-555-7779 after 5:30 or at the above address.

Sincerely yours,

John Clark

John Clark

Enclosure

ORIENTATION
UNIT I

ASSIGNMENT SHEET #3 — COMPLETE EMPLOYMENT APPLICATION FORM FOR A JOB AS A FIELD OPERATOR

NAME ______________________ SCORE ______________________

Directions: Complete the following application form using the guidelines below. Use information corresponding to your letter of application. Use information about yourself from your resumé.

(NOTE: Although each business uses its own form, general rules of preparation apply to any form.)

1. Be prepared.
   a. Take a good ink pen with you.
   b. Take copies of resumé.
2. Look over entire form before starting to write; do not hurry.
3. Follow directions.
4. Write or print clearly, neatly, and legibly.
5. Answer briefly.
6. Be honest.
7. Answer all questions.

   (NOTE: If questions do not apply to you, write Not Applicable or NA in the space to show that you did not overlook the question.)
8. Include complete information; use resumé.
9. Recheck application when finished.
10. Avoid cross-outs and obvious erasure marks.

ASSIGNMENT SHEET #3

____
(Date)

APPLICATION FOR EMPLOYMENT

PRINT IN INK OR TYPE

Personal Data:

Last Name ______________________ First ______________________ Middle ______________

Address ____

City, State, Zip ____

Home Phone (   )   -   Work Phone (   )   -

If you have no phone, name of person and phone number where we may leave a message for you ______________

____

Social Security Number   -   -

Education Data:

SCHOOL	NAME & LOCATION OF SCHOOL	COURSE OF STUDY OR MAJOR/MINOR	NO. OF YEARS OR HOURS COMPLETED	DEGREE, DIPLOMA, OR CERTIFICATE RECEIVED
High School				
Vocational-Technical School				
College/ University				
Other				

Employment Data: (Start with present or most recent employment)

1. Company ______________________ Telephone (   )   -

Address ______________________ Employed from __________ to __________

Name of Supervisor ______________________ Part-time ☐ Full-time ☐

Job Title and Type of Duties Performed ______________________ Reason for Leaving ______________________

ASSIGNMENT SHEET #3

2. Company ______________________ Telephone (____) ____-________
Address ______________________ Employed from ________ to ________
Name of Supervisor ______________________ Part-time ☐ Full-time ☐
Job Title and Type of Duties Performed ______________________ Reason for Leaving ______________________

3. Company ______________________ Telephone (____) ____-________
Address ______________________ Employed from ________ to ________
Name of Supervisor ______________________ Part-time ☐ Full-time ☐
Job Title and Type of Duties Performed ______________________ Reason for Leaving ______________________

May we contact the employers listed above in regard to your job performance?
Yes ☐ No ☐ Specify ______________________

References:

1. Name ______________ Address ______________ Phone ______________
2. Name ______________ Address ______________ Phone ______________
3. Name ______________ Address ______________ Phone ______________

May we contact the references listed above in regard to your job performance?
Yes ☐ No ☐ Specify ______________________

Application:

Have you ever worked for us before? Yes ☐ No ☐ If yes, what position(s)?
____

Type of position(s) desired
1. ______________ 2. ______________ 3. ______________

Date available to begin work ______________

Please describe below why you would be an asset to this company if you were hired. List experience, skills, and training that qualify you for the applied position. Be specific.

____
____
____
____
____
____

Equal Opportunity Employer

ORIENTATION
UNIT I

TEST

NAME ______________________ SCORE ______________________

1. Match the terms on the right with the correct definitions.

______a. Capable of being read; clear

______b. Brief, typed summary of one's qualifications and experience that is used in applying for a job

______c. A system which provides compensation to employees injured on the job

______d. Extras provided by an employer, such as paid vacations, sick leave, and insurance protection

______e. Recognition received for outstanding achievement

______f. Established to insure equal pay for equal work on the jobs that require equal skills and responsibilities

______g. Regulates the use of toxic pesticides by requiring applicators to prove their knowledge of pesticide use and safety

1. Workers compensation insurance
2. Award
3. Fringe benefits
4. Resumé
5. Legible
6. Fair Labor Standards Act
7. Pesticide application certification

2. List four careers related to groundskeeping.

a. ____

b. ____

c. ____

d. ____

3. List three areas of groundskeeping job opportunities.

a. ____

b. ____

c. ____

TEST

4. Distinguish between the types of groundskeeping skill levels by placing an **A** for field operator, **B** for field specialist, and **C** for field supervisor next to the correct descriptions.

(NOTE: More than one answer may be possible for the descriptions given.)

_____a. Performs basic landscape maintenance services

_____b. Instructs workers on proper methods for carrying out job tasks

_____c. Operates and assists in the maintenance of equipment

_____d. Performs basic record keeping tasks

_____e. Applies pesticides

_____f. Calculates fertilizer and seeding rates

_____g. Assigns daily tasks for the crews

_____h. Supervises irrigation system installation

5. List eight common job tasks of groundskeeping.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

f. ______________________________

g. ______________________________

h. ______________________________

6. Name four general groundskeeping working conditions.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

TEST

7. Name four sources of information about job openings.

a. ____________________

b. ____________________

c. ____________________

d. ____________________

8. List three principal methods of applying for a job.

a. ____________________

b. ____________________

c. ____________________

9. Name four items which may be required when applying for a job.

a. ____________________

b. ____________________

c. ____________________

d. ____________________

10. Select true statements concerning guidelines to follow when participating in a job interview by placing an "X" next to the correct statements.

_____a. Arrive late to give the impression that you are a busy person.

_____b. Wait impatiently outside of the interview room.

_____c. Call the interviewer by his or her first name.

_____d. Sit still or stand quietly and erect.

_____e. Answer questions completely and honestly.

_____f. Be polite and courteous.

_____g. Use slang expressions.

_____h. Look the interviewer in the eye.

_____i. Smoke or chew gum if needed to calm your nerves.

TEST

_____j. Be sure to take parents along and tell interviewer they are waiting for you if interview runs too long.

_____k. Show interest in the business.

_____l. Thank interviewer for his/her time.

_____m. Flatter the interviewer.

_____n. Show interest in the business; ask questions.

_____o. Follow up the interview with a letter, phone call, or visit.

11. Select from the following list the attributes an employer looks for in an employee by placing an "X" next to the correct attributes.

_____a. Blue eyes

_____b. Enthusiasm and interest

_____c. New car

_____d. Desire to work

_____e. Ability to work with others

_____f. Honesty and integrity

_____g. Beard

_____h. New clothes

_____i. Alertness, quickness of mind

_____j. Dependability

12. Select true statements concerning dressing for work by placing an "X" next to the true statements.

_____a. Wear clothing that is too large so you can grow into it.

_____b. Wear clean, neat clothes.

_____c. Wear sleeveless shirts or tank tops if the weather is hot.

_____d. Long pants are only needed in the winter.

_____e. Wear durable, comfortable shoes that protect your ankles and toes.

TEST

_____f. Wear sandals if you will be working in a lot of water or if the weather is hot.

_____g. Bathe often and wear clean clothes to prevent body odors.

_____h. Brush your teeth regularly.

_____i. Keep your hair clean and neat.

_____j. No special clothing is needed in the winter because you won't be working outside in the winter.

13. Name three components of a general safety program.

a. ______________________________

b. ______________________________

c. ______________________________

14. Select true statements concerning how to dress safely by placing an "X" next to the true statements.

_____a. Never wear gloves as they get in the way.

_____b. Wear any type of shoes, especially sandals, to keep feet cool.

_____c. Wear hats, long pants, and comfortably-fitting shirts to provide protection from hot temperatures, splashing materials, and rough and sharp objects.

_____d. Wear long hair free and flowing to keep cool.

_____e. Never wear specialized equipment.

15. Complete the following statements concerning the proper handling of pesticides and other hazardous materials by filling in the blanks.

a. Hazardous materials should be stored in ____________________ areas.

b. Hazardous materials should be stored in ____________________ containers.

c. Name two types of protective clothing that should be worn when handling chemicals.

1) ______________________________

2) ______________________________

TEST

d. Name three symptoms of pesticide poisoning.

1) ______________________________

2) ______________________________

3) ______________________________

e. Where is the closest poision control center for your area? ______________

f. How should you handle spills? ______________________________

____

____

16. Select true statements concerning safety procedures to follow on the job by placing an "X" next to the true statements.

_____a. Operate equipment only after carefully studying operating instructions.

_____b. Loose objects such as wire and nails should only be picked up by the cleanup crew.

_____c. When lifting an object, use your back muscles.

_____d. If an object is too heavy, get help or use ramps, hoists, or pry bars for lifting.

_____e. Only supervisors need to participate in safety programs.

_____f. A Class A fire involves electrical wiring or electrical motors.

_____g. A Class B fire involves flammable liquids such as gasoline or flammable gases such as propane.

(NOTE: If the following activities have not been accomplished prior to the test, ask your instructor when they should be completed.)

17. Write a resumé. (Assignment Sheet #1)

18. Write a letter of application for a groundskeeping job. (Assignment Sheet #2)

19. Complete employment application form for a job as a field operator. (Assignment Sheet #3)

ORIENTATION
UNIT I

ANSWERS TO TEST

1. a. 5
   b. 4
   c. 1
   d. 3
   e. 2
   f. 6
   g. 7

2. Any four of the following:

   a. Landscape architect
   b. Landscape designer
   c. Landscape contractor
   d. Nurseryman
   e. Greenskeeper
   f. Specialty careers

3. a. Governmental groundskeeping
   b. Residential groundskeeping
   c. Industrial or commercial groundskeeping

4. a. a, b, c
   b. c
   c. a, b, c
   d. b, c
   e. b, c
   f. b, c
   g. c
   h. c

5. Any eight of the following:

   a. Mowing
   b. Pruning, trimming, grooming
   c. Pest identification and control
   d. Planting and replacing plant materials
   e. Cultivation
   f. Maintenance of nonplant structures
   g. Irrigation installation and application
   h. Fertilizer application
   i. Mulching and composting
   j. Thatch removal
   k. Installing new and reseeding existing turf
   l. Snow removal
   m. Equipment maintenance and repair

ANSWERS TO TEST

6. Any four of the following:
    - a. Work out of doors
    - b. Operate away from the office for several hours at a time
    - c. Work alone or as a crew member
    - d. Operate out of a service vehicle
    - e. Involves light to heavy manual labor

7. Any four of the following:
    - a. Classified ads
    - b. Current workers in groundskeeping industry
    - c. School officials
    - d. Employment offices
    - e. Cooperative extension personnel
    - f. Local labor union business offices
    - g. Friends and family members

8. a. By letter
    - b. By telephone
    - c. In person

9. Any four of the following:
    - a. Resumé
    - b. Letter of application
    - c. Application form
    - d. Transcript(s)
    - e. Follow-up letter or phone call

10. d, e, f, h, k, l, n, o

11. b, d, e, f, i, j

12. b, e, g, h, i

13. Any three of the following:
    - a. First aid techniques
    - b. Dressing safely
    - c. Proper use of equipment
    - d. Proper handling of pesticides and other hazardous materials
    - e. Proper safety attitudes

ANSWERS TO TEST

14. c

15. a. Any of the following: Safe, well-lighted, insulated, fireproof, well-ventilated, clearly marked as storage

    b. Any of the following: Tightly closed, clearly marked, permanently labeled

    c. Any two of the following:
    1) Chemical resistant gloves
    2) Chemical resistant shoes
    3) Protective goggles
    4) Respirators
    5) Disposable suits and aprons

    d. Any three of the following:
    1) Nausea, diarrhea
    2) Headache, dizziness, fatigue
    3) Redness, blisters, rash on skin
    4) Swelling and stinging sensation in eyes, nose, mouth, or throat
    5) "Flu" or "hangover" type symptoms
    6) Irritable and unnatural behavior

    e. Evaluated by instructor

    f. Discussion should include:
    1) Immediately notify supervisor if possible
    2) Remove contaminated clothing
    3) Wash thoroughly
    4) Clean up spill with correct material

16. a, d, g

17.-19. Evaluated to the satisfaction of the instructor.

HAND TOOLS
UNIT II

UNIT OBJECTIVE

After the completion of this unit, the student should be able to select, use, and maintain groundskeeping hand tools. Competencies will be demonstrated by completing the job sheets and the unit tests with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to hand tools with the correct definitions.
2. List considerations in choosing hand tools for particular jobs.
3. List the variations of hand tool construction.
4. Select true statements describing characteristics of quality tools.
5. Label the parts of a hoe.
6. Match types of hoes with their uses.
7. Label the parts of a rake.
8. Match types of rakes with their uses.
9. Label the parts of a shovel.
10. Identify the types of shovels.
11. Label the parts of a spade.

OBJECTIVE SHEET

12. Identify the types of spades.
13. Label the parts of a fork.
14. Match types of forks with their uses.
15. Label the parts of hand pruners.
16. Distinguish between the types of hand pruners.
17. Label the parts of a bypass type lopper.
18. Match types of loppers and pole pruners with their uses.
19. Identify types of pruning saws.
20. Identify types of wheelbarrows and carts.
21. Match types of spreaders with their uses.
22. Match specialty hand tools with their uses.
23. Select true statements concerning general procedures for maintaining hand tools.
24. Select true statements concerning procedures for properly storing tools for the winter.
25. Complete statements concerning techniques for sharpening tools.
26. Select true statements describing safety precautions to follow when using hand tools.
27. Demonstrate the ability to:
    a. Use hand tools properly. (Job Sheet #1)
    b. Remove rust from tools. (Job sheet #2)
    c. Condition weathered wooden handles. (Job Sheet #3)
    d. Sharpen a hoe. (Job Sheet #4)
    e. Replace a shovel handle. (Job Sheet #5)

HAND TOOLS
UNIT II

SUGGESTED ACTIVITIES

A. Obtain additional materials and/or invite resource people to class to supplement/reinforce information provided in this unit of instruction.

(NOTE: This activity should be completed prior to the teaching of this unit.)

B. Provide students with objective sheet.

C. Discuss unit and specific objectives.

D. Provide students with information sheet.

E. Discuss information sheet.

F. Provide students with job sheets.

G. Discuss and demonstrate the procedures outlined in the job sheets.

H. Integrate the following activities throughout the teaching of this unit:

1. Obtain specification sheets from manufacturers on individual equipment cost.
2. Obtain tool catalogs to show the many types of hand tools available.
3. Demonstrate the proper use of as many hand tools as possible. (Job Sheet #1)
4. Demonstrate cleaning and maintenance procedures for hand tools.
5. Visit garden centers or hardware stores to see types of hand tools and their cost.
6. Demonstrate sharpening hand tools by using the files, grinders, whetstones, and other tools available in your classroom.
7. Demonstrate how to replace a pick, mattock, or grading hoe handle.
8. Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas for improvement.

I. Give test.

J. Evaluate test.

K. Reteach if necessary.

RESOURCES USED IN DEVELOPING THIS UNIT

A. *Basic Gardening Illustrated.* Menlo Park, CA: Sunset Books, Lane Publishing Co., 1975.

B. Beard, James B. *How to Have a Beautiful Lawn.* College Station, TX: Beard Books, 1983

C. Beard, James B. *Turfgrass: Science and Culture.* Englewood Cliffs, NJ: Prentice-Hall, Inc., 1973.

D. Hannebaum, Leroy G. *Landscape Operations: Management, Methods, and Materials.* Reston, VA: Reston Publishing Co., 1980

E. *How to Select, Use, and Maintain Garden Equipment.* San Francisco, CA: Ortho Books, Chevron Chemical Co., 1981.

F. Ingles, Jack E. *Landscaping: Principles and Practices.* Albany, NY: Delmar Publishers, Inc., 1987.

G. Ingles, Jack E. *Ornamental Horticulture: Principles and Practices.* Albany, NY: Delmar Publishers, Inc., 1985.

H. *Pruning Handbook.* Menlo Park, CA: Sunset Books, Lane Publishing Co., 1978.

I. Sprague, Howard B. *Turf Management Handbook.* Danville, IL: Interstate Printers and Publishers, Inc., 1982.

SUGGESTED SUPPLEMENTAL RESOURCES

A. Safety Products Catalog — Direct Safety Company
P.O. Box 50050
Phoenix, Arizona 85076-0050

B. Tools & Supply Catalog — A. M. Leonard, Inc.
6665 Spiker Road
Piqua, Ohio 45356

HAND TOOLS
UNIT II

INFORMATION SHEET

I. **Terms and definitions**

A. Burr — A rough edge left on metal

B. Degree of cant — Position of a shovel or spade blade in relation to the handle

(NOTE: The greater the degree of cant, the more leverage the tool will have in lifting. A lesser degree of cant is best for digging straight down the sides of a hole.)

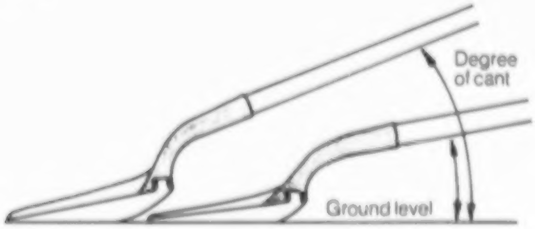


Illustration reprinted with permission of Ortho Books, ©1981.

C. Forging — Hammering and compressing steel making it more dense, uniform, and therefore, stronger

D. Rust — Material resulting from a corrosive process promoted by the presence of moisture on metal

E. Sharpening — Beveling to a keen edge the cutting side of a blade

F. Sprung — Condition resulting from forcing pruning tools to cut through limbs by twisting tool back and forth

II. **Considerations in choosing hand tools for particular jobs**

A. Type of soil

Example: Heavy clay or rocky soil requires a sturdy tool.

B. Height and strength of the user

Example: A shorter worker needs a shorter handle.

C. Size of job

Example: Digging a trench requires stronger tools than digging a planting hole.

(NOTE: Smaller tools may be easier to use, but the job will be done slower.)

INFORMATION SHEET

D. Handle length

Example: If you are standing, you need a cultivator with a long handle, but if you are kneeling, you need a hand cultivator.

E. Right tool for the job

Example: When digging a ball and burlap planting hole, a spade would be better than a hoe or scoop shovel.

F. Degree of cant

Example: When scooping leaves and excess soil, a higher degree of cant will help avoid laying the shovel flush with the ground to lift material.

G. How often the tool will be used

Example: A shovel may be used to dig a planting hole rather than a spade if only one small hole is needed.

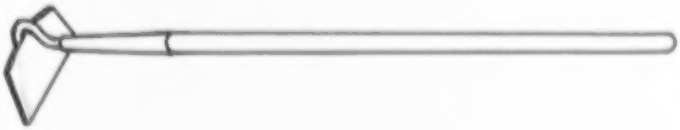
III. Variations of hand tool construction

A. Handle lengths

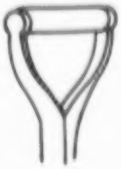
1. Rakes — 50" to 60"
2. Shovels — 40" to 48"
3. Spades — 30" to 40"

B. Handle grips

1. Straight handle

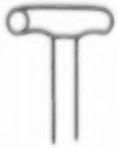


2. "D" handle



INFORMATION SHEET

3. "T" handle

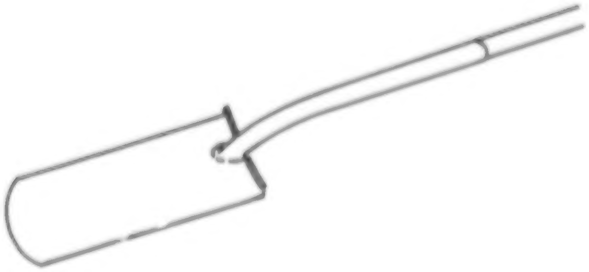


C. Handle materials

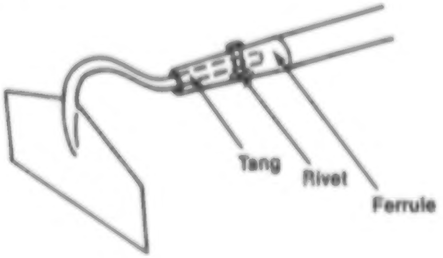
1. Metal
2. Hardwood — ash, hickory
3. Fiberglass

D. Head attachment

1. Forged socket and shank

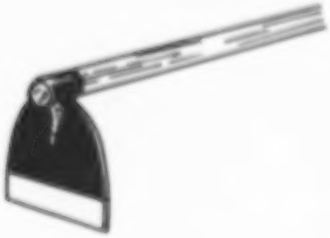


2. Tang-and-ferrule


Tang
Rivet
Ferrule

INFORMATION SHEET

3. Eye



E. Head weight — Light or heavy

Example: Heavy pick and mattock heads add to the striking force of the tool.

F. Head materials

1. Forged steel
2. Stamped sheet metal
3. Heavy plastics
4. Stainless steel
5. Cast iron
6. Aluminum-alloy
7. Plated steel
8. Bamboo

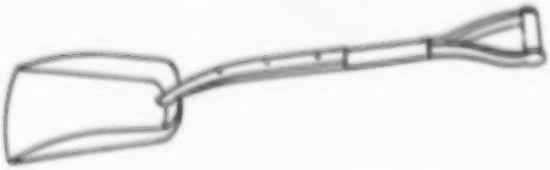
G. Reinforcement

1. Socket — Closed socket is stronger than open.

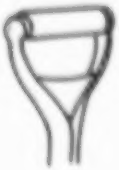
Open Back
Closed Back

INFORMATION SHEET

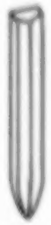
2. Straps — Forged-steel straps extending more than ½ the handle length



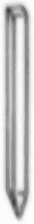
3. Grip — "D" handle



4. Tines — Square tines add strength to forks.



Diamond



Square

IV. **Characteristics of quality tools**

A. Metal heads are made of stainless or forged steel in one piece.

B. Heads are attached tightly by closed socket.

C. Handles are made of rolled steel, fiberglass, or smooth hardwood such as hickory or ash.

D. Grains of wooden handles should run in the same direction as the force exerted on the tool.

E. Reinforced tool handles and heads are meant for heavy use.

F. Saw teeth are beveled providing a good cutting edge.

INFORMATION SHEET

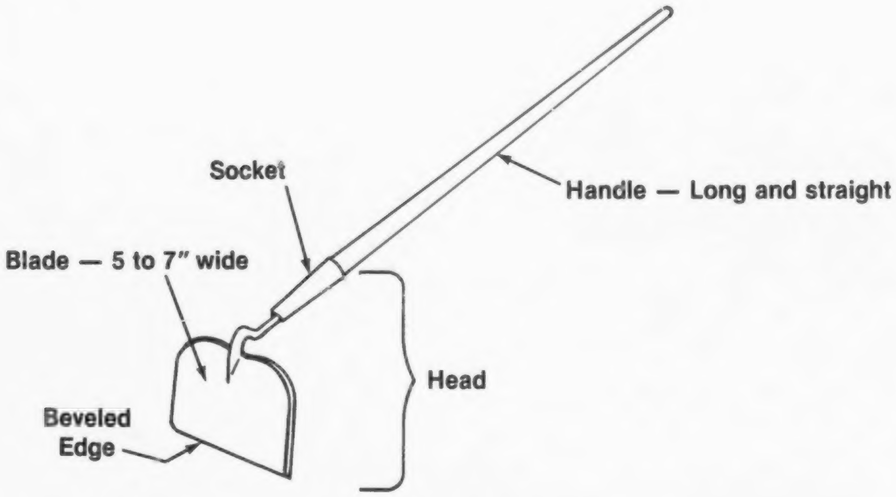
G. Wide tires on carts and wheelbarrows are best for use on turf.

H. All moving parts work smoothly.

I. Cutting edges have no nicks or burrs.

J. All screws and bolts are placed correctly and securely.

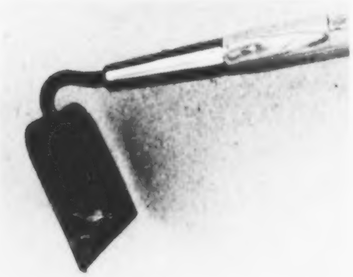
V. Parts of a hoe


Socket
Handle — Long and straight
Blade — 5 to 7" wide
Head
Beveled Edge

VI. Types of hoes, their uses, and characteristics

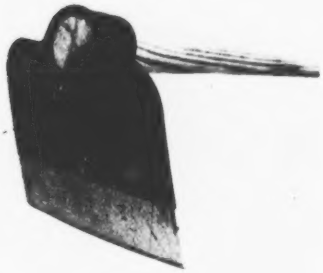
A. General garden hoe

1. Loosening and moving light soil
2. Breaking soil surface
3. Weeding
4. Cultivating plant beds
5. Slightly angled blade 5" to 7" wide
6. One to three sharp beveled edges



INFORMATION SHEET

B. Grading hoe (also called grub or eye hoe)

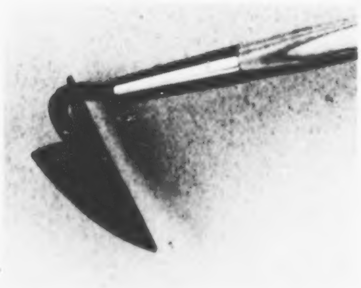


1. For tough jobs
2. Chopping weeds and small brushy shrubs
3. Loosening hard, compacted soil
4. Planting bed preparation
5. Head fits directly onto handle
6. Various blade sizes

C. Scuffle hoe

1. Weeding by cutting off tops of plants
2. Light cultivating of loose, rock-free soil
3. Heads angled flat to the ground
4. 1 to 3 sharp edges

D. Triangle hoe

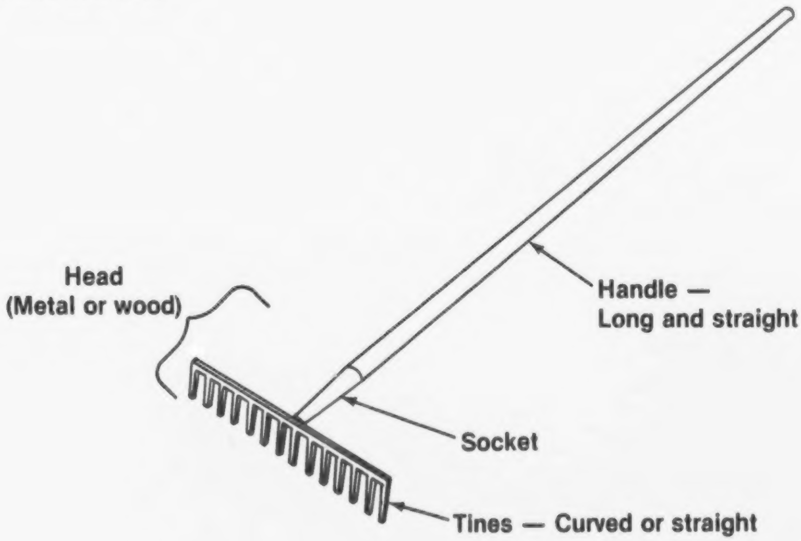


1. Light cultivating
2. Breaking stubborn soil
3. Weeding by uprooting the whole plant
4. Reaching tight spots under shrubs
5. Making rows

INFORMATION SHEET

E. Push hoe 	1. Weeding by moving back and forth cutting both directions 2. Edging 3. Sharp front and back blade

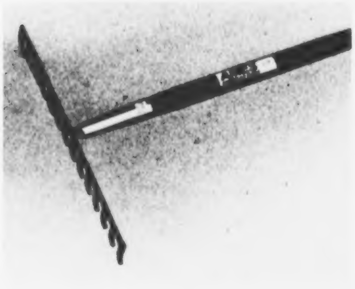
VII. Parts of a rake


Head
(Metal or wood)
Handle —
Long and straight
Socket
Tines — Curved or straight

INFORMATION SHEET

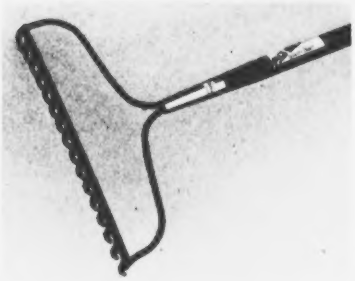
VIII. Types of rakes, their uses, and characteristics

A. Flathead rake (also called a gravel rake or asphalt rake)



1. Planting beds and vegetable gardens
2. Smoothing surfaces by turning rake over
3. Final cultivating of seed beds
4. Breaking clods
5. Raking rocks and twigs but not heavy soil
6. 13" to 16" wide steel head
7. Flat, straight tines
   (NOTE: Do not use on lawns because tines will damage the turf.)

B. Bowhead rake



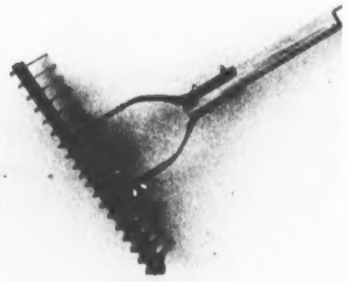
1. Planting beds and vegetable gardens
2. Leveling soils
3. Raking heavy soil
4. Flexible, wide steel head
   (NOTE: Do not use on lawns because this will damage the turf.)

C. Leveling or grading rake

1. Installing new lawns
2. Breaking up and spreading soft soil
3. Smoothing seed bed by turning rake head over to work area
4. Straight 4" tines
5. Very wide head, 25" to 30"

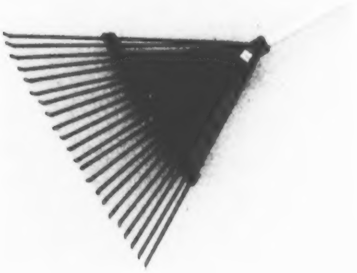
INFORMATION SHEET

D. Thatching rake



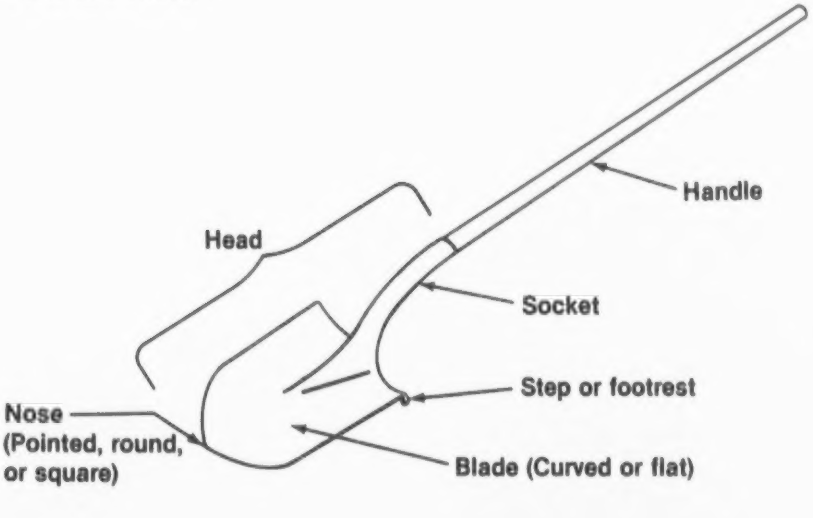
1. Removing matted materials
2. Pushing and pulling through turf
3. Cutting blades or curved tines
4. Some heads adjust to various angles

E. Leaf or broom rake



1. Sweeping or raking debris, leaves, and clippings without damaging turf
2. Metal, polypropylene, or bamboo heads

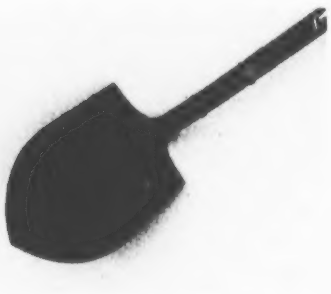
IX. Parts of a shovel


Handle
Head
Socket
Step or footrest
Nose
(Pointed, round, or square)
Blade (Curved or flat)

INFORMATION SHEET

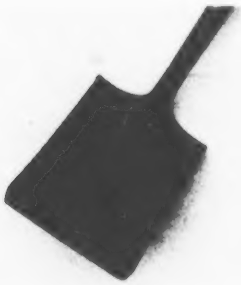
X. Types of shovels, their uses, and characteristics

A. Round-nose shovel



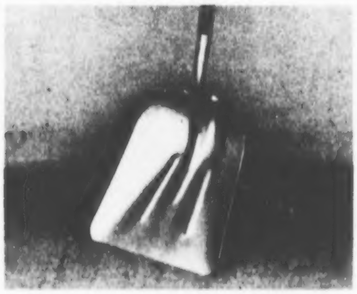
1. Lifting loose sand and soil
2. Scooping
3. Cleaning trenches and drains
4. Digging ditches
5. Preparing planting holes

B. Square-nose shovel



1. Lifting heavy materials
2. Scooping soil, sand, gravel, concrete, rocks
3. Flat face and high sides

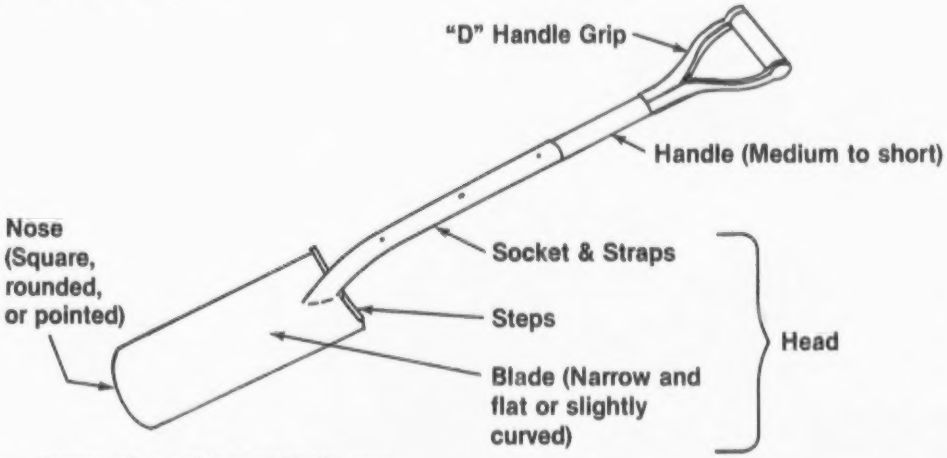
C. Scoop shovel



1. Lifting lightweight materials (NOTE: Pull heavy loads along ground instead of lifting.)
2. Scooping sawdust, mulch, snow, rocks, debris
3. Not for digging
4. Wide face and high sides
5. High degree of cant

INFORMATION SHEET

XI. **Parts of a spade**

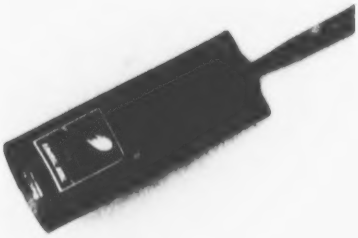

"D" Handle Grip
Handle (Medium to short)
Nose (Square, rounded, or pointed)
Socket & Straps
Steps
Head
Blade (Narrow and flat or slightly curved)

XII. **Types of spades and their uses**

A. Garden spade

1. Digging straight-sided, flat-bottomed planting holes
2. Cutting bed edges
3. Removing sod layer
4. Flat blade with no sides
5. Socket or straps extend to 1/3 of handle for strength
6. Small degree of cant

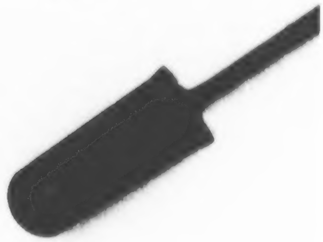
B. Tree spade



1. Digging deep, rounded planting holes
2. Slicing heavy soils
3. Digging trenches
4. Wide steps
5. Curved, long, narrow blade with square nose
6. Steel straps reinforce 1/2, 3/4, or full length of handle

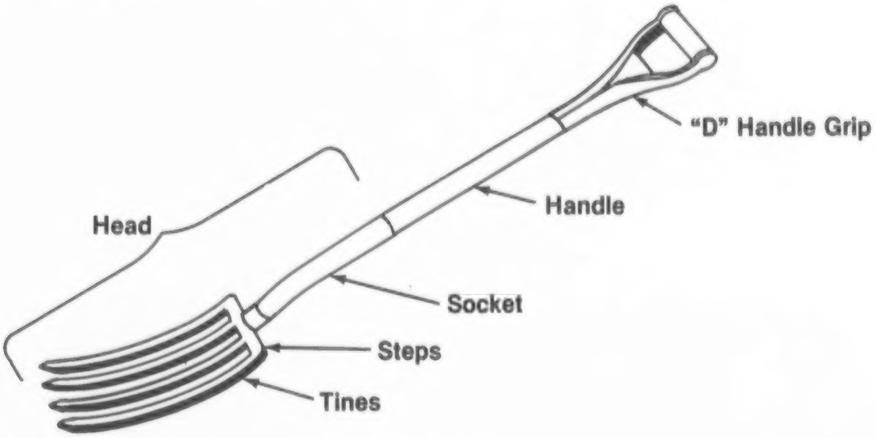
INFORMATION SHEET

C. Transplanting spade (trencher)



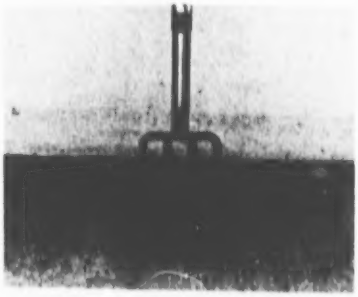
1. Digging out plant materials to be moved
2. Digging ditches and trenches
3. Narrow curved blade with pointed or rounded nose

XIII. Parts of a fork



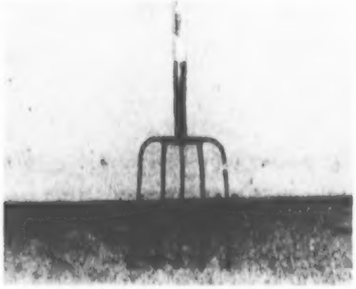
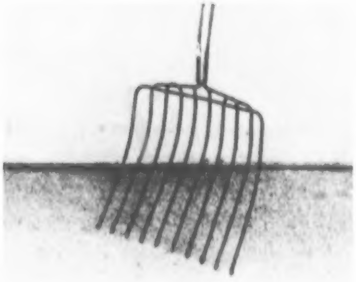
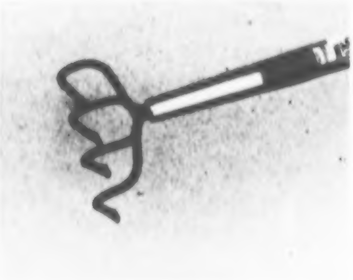
XIV. Types of forks, their uses, and characteristics

A. Garden fork



1. Working planting beds
2. Lifting soil
3. Dividing perennial plant clumps
4. Digging heavy soil
5. Small head
6. Diamond-shaped or square tines
7. Short handle

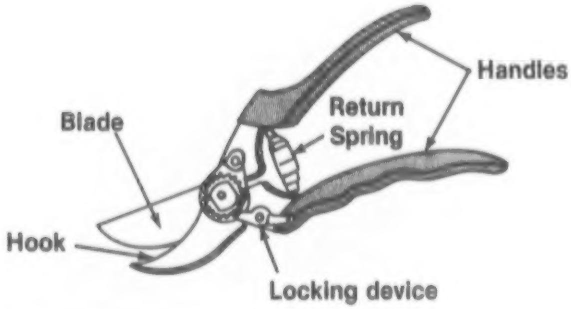
INFORMATION SHEET

B.	Manure forks 	1. Lifting or moving loose materials 2. Mulching 3. Not for digging 4. 4 to 5 long, tapered tines 5. Long tapered or "D" grip handle
C.	Scoop fork 	1. Scooping compost 2. Lifting debris from usable mulch 3. Not for digging 4. Multiple, curved tines 5. Long socket
D.	Tine cultivator, potato fork 	1. Coarse raking 2. Raking debris from under shrubs 3. Cultivating deeper than rake 4. Breaking up clods 5. 4-5 round tines 6. Tines bent at sharp angle

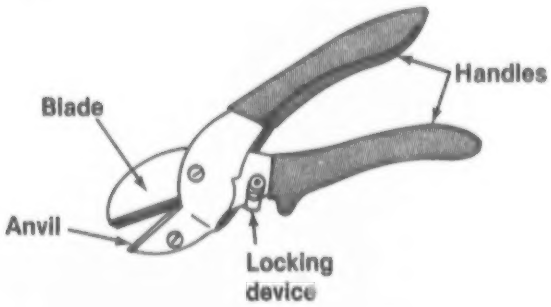
INFORMATION SHEET

XV. **Parts of hand pruners or shears**

A. Bypass (scissor-cut) blade pruner


Handles
Blade
Return Spring
Hook
Locking device

B. Anvil blade pruner


Handles
Blade
Anvil
Locking device

XVI. **Types of hand pruners, their uses, and characteristics**

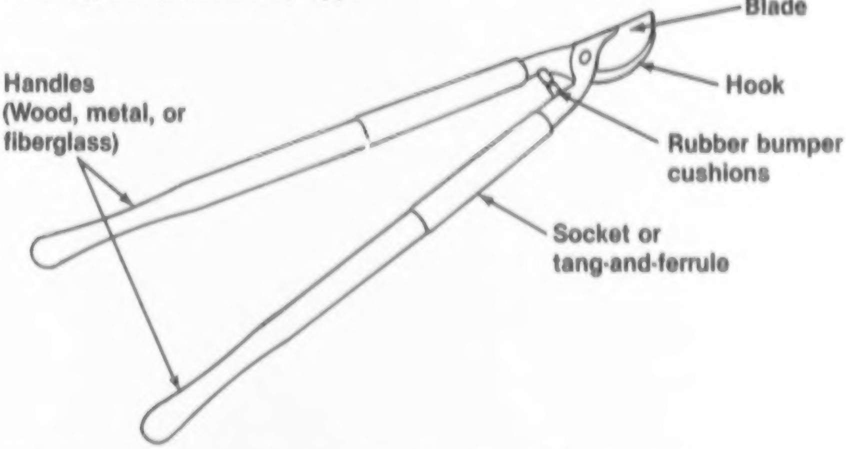
A. Bypass blade pruners

1. Cutting in narrow spaces
2. Cutting up to 3/4" diameter twigs
3. Cutting very close to main limb
4. Clipping flowers and stems, shrubs, and trees
5. Preferred by professionals

B. Anvil blade shears

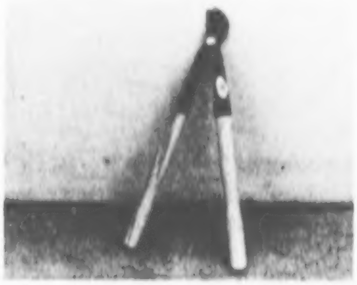
1. Cutting twigs to ¾" in diameter
2. Cutting in open spaces
3. Cannot cut very close to main limb
4. Clipping flowers and stems, shrubs, and trees
5. Can crush stems

XVII. **Parts of bypass (scissor-cut) lopper**


Blade
Hook
Handles (Wood, metal, or fiberglass)
Rubber bumper cushions
Socket or tang-and-ferrule

XVIII. **Types of loppers and pole pruners, their uses, and characteristics**

A. Bypass (scissor-cut) lopper



1. Cutting in narrow spaces
2. Cutting up to 2" diameter limbs
3. Cutting shrubs and trees

INFORMATION SHEET

B. Anvil loppers

1. Cutting up to 2" diameter limbs
2. Cutting in open areas or wide crotch
3. Heavy cuttings
4. Cutting shrubs and trees
5. Can crush stems

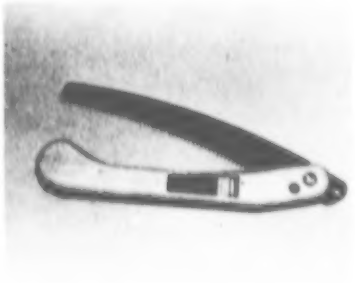
C. Pole pruner

1. Cutting overhead branches from the ground
2. Cutting 1¼" - 1¾" diameter branches
3. Commonly has hook and blade (scissor-cut) action operated by a rope or metal rod through a pulley or lever system
4. Pole may be one-piece, sectional, or telescoping
5. Pole may be wood, metal, or fiberglass **(CAUTION: Wood and metal poles conduct electricity and should not be used near electrical lines. Fiberglass may be acceptable.)**

XIX. **Types of pruning saws and their uses**

(NOTE: Depending on the saw, the cut will be made on the push or pull motion, sometimes both.)

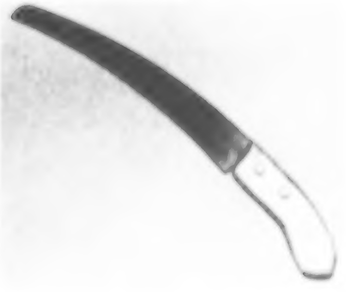
A. Folding saw



1. Cutting branches 1" to 3" in diameter on small shrubs and fruit trees
2. Blade 6" to 8" long

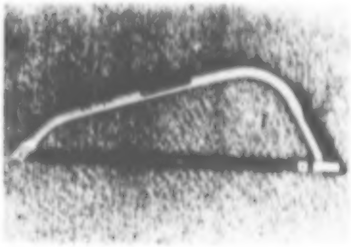
INFORMATION SHEET

B. Curved blade saw



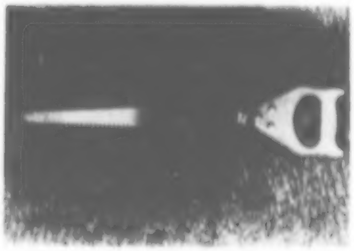
1. Cutting limbs 3" in diameter and larger
2. Sawing limbs at various angles
3. Cutting green and dead wood
4. Pruning trees and large shrubs
5. Rigid handle
6. Blade 12" to 30" long

C. Bow saw



1. Pruning trees and large shrubs
2. Difficult to use in crowded branches
3. Cutting limbs 10" to 25" in diameter
4. Narrow tip
5. Blade 15" or longer

D. Double-edged saw



1. Cutting both green and dry wood
2. Fine-tooth edge for cutting small branches and dry wood
3. Coarse-tooth edge for cutting green or sap wood
4. Coarse, raker teeth pull sawdust out to prevent jamming
   (CAUTION: Top edge may wound desirable branches while cutting with lower edge.)

INFORMATION SHEET

E. Pole saw

1. Cutting limbs 3" and larger
2. Cutting overhead limbs 4 to 6 feet away from user
   (NOTE: Combination pole saw/pruners are also available.)

XX. **Types of wheelbarrows and carts, their uses, and characteristics**

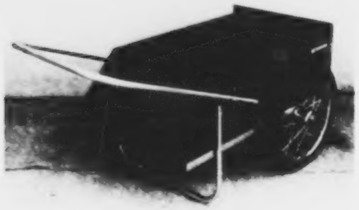
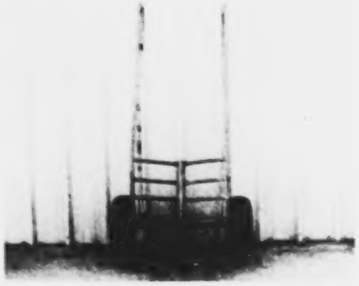
A. All-purpose wheelbarrow

1. Hauling soil, rock, and debris
2. Mixing amendments, concrete, and soil
3. Light to heavy weight

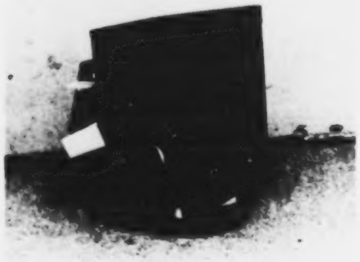
B. Sod and tile barrow

1. Hauling sod, tiles, plants, etc.
2. Hardwood body on metal frame

INFORMATION SHEET

C. Utility cart 	1. Moving large, bulky loads 2. Available with various sizes and types of beds and wheels
D. Nursery cart or "truck" 	1. Moving plants and materials 2. Wide tires are recommended for use on turf areas

XXI. Types of spreaders and their uses

A. Hand-held broadcast spreader 	1. Applying seed, fertilizer, granular pesticide, and ice melters 2. Easy to use on rough surfaces 3. Can be used to spread material over planted beds and shrubs 4. Can cover large areas quickly 5. Hand crank distributes the material to be spread 6. Made of various materials and sizes that hold 2 to 10 lbs of material

INFORMATION SHEET

B. Push broadcast spreader

1. Applying seed, fertilizer, granular pesticides, ice melters, and soil amendments.
2. Primarily for use on smooth, level surfaces
3. Various sizes hold 20 to 80 lbs. of material

(NOTE: Broadcast spreaders distribute material in a full circle applying less material at the edges than middle. Patterns should be overlapped for even coverage.)

C. Drop spreader

1. Applying granular fertilizers, ice melters, and pesticides
2. Seeding new lawns
3. Use on smooth, level surfaces
4. Various models are designed to push by hand or pull by tractor
5. Various sizes hold 30 to 80 lbs of material (NOTE: Drop spreaders distribute material in an even band the width of the hopper through holes in the bottom. Overlap the wheel tracks for uniform application.) **(CAUTION: Never leave materials in spreader hoppers because they are very corrosive! They absorb moisture, and can cause rusting of the spreader.)**

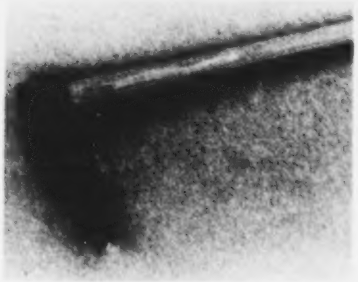
XXII. Specialty hand tools, their uses, and characteristics

A. Pick

1. Breaking up hard, rocky soil
2. Breaking up root-filled soil
3. Trenching

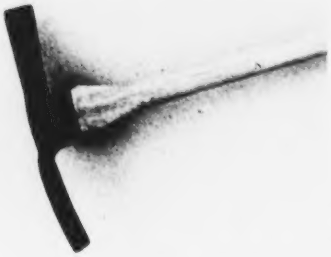
INFORMATION SHEET

B. Mattock



1. Loosening heavy, compacted soil
2. Digging narrow ditches
3. Cutting roots
4. Chopping

C. Pick-mattock



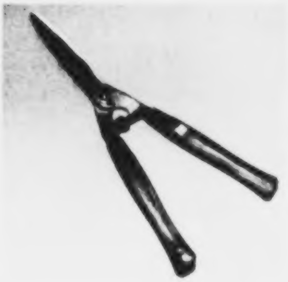
1. Breaking up hard, root-filled soil
2. Loosening soil
3. Digging
4. Chopping

D. Post-hole (clamshell) digger

1. Digging holes for fence, deck, and other support posts
2. Digging holes in hard, rocky soil
3. 4′ long handles

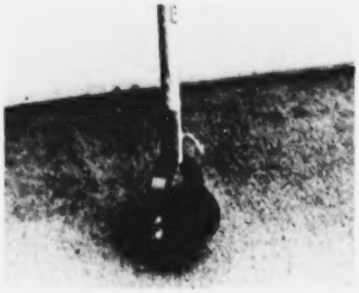
INFORMATION SHEET

E. **Hedge shears**



1. Shaping shrubs and hedges
2. Cutting level or vertical sides of hedges
3. Cutting young, tender growth up to ½" thick
4. Limb notch is used to cut individual thick stems
5. Serrated or plain blades

F. **Rotary edger**



1. Cutting lawn edges flush to the drive and walk edges
2. Has 6" cutting blade that rotates with the rubber-tired wheel

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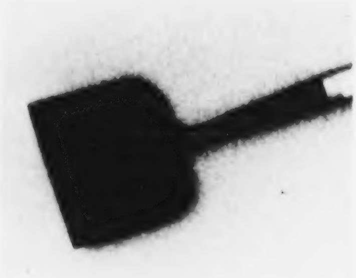
G. **Turf edger**



1. Cutting soil and turf along walks
2. Recutting overgrown edges
3. Edge may be curved or straight

INFORMATION SHEET

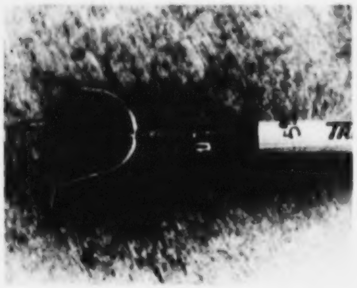
H. Trowel

1. Planting bedding plants, ground covers, bulbs
2. Digging furrows in soft soil
3. Weeding
4. General garden work

I. Grass shears

1. Trimming grass and foliage along drives, walks, bed edges, and posts
2. Scissor cut

J. Cultivator



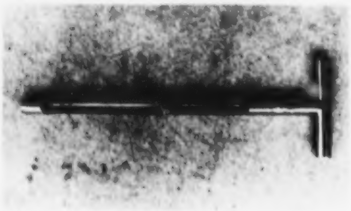
1. Loosening soil
2. Mixing amendments
3. Raking
4. Weeding
5. Breaking up clods
6. May have long or short handle

INFORMATION SHEET

K. Pry bar

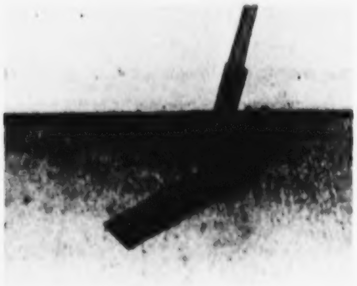
1. Dislodging (prying) heavy rocks, roots, etc.
2. Breaking up heavy clay soils or rocks
3. Available in various lengths and diameters

L. Soil probe



1. Collecting soil samples for testing
2. Checking depth of soil moisture

M. Grass whip



1. Cutting grass and succulent weeds
2. Reducing high grass to a mowable height

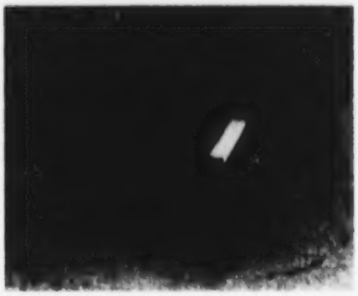
INFORMATION SHEET

N. Swing blade, weed cutter

1. Cutting heavy, fibrous weeds at ground level
2. Has double edge V cutting blade

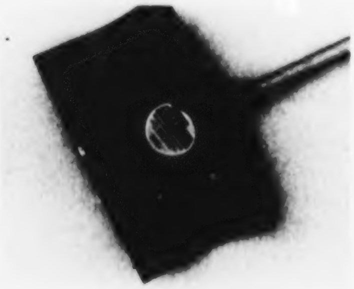
O. Grass hook

1. Cutting high, heavy, fibrous weeds
2. Has single edge, curved cutting blade



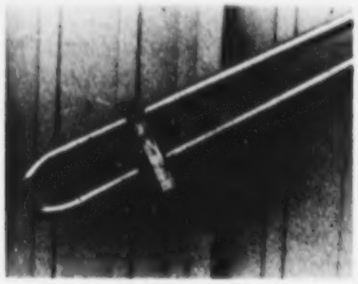
P. Snow shovel

1. Scooping snow or debris
2. Blade made of lightweight materials such as aluminum or plastic



INFORMATION SHEET

Q. Clean-up caddy



1. Picking up small objects, trash, cans, and bottles without bending
2. Some models have a metal spring in tip for gathering debris while others are designed like large tongs or pinchers

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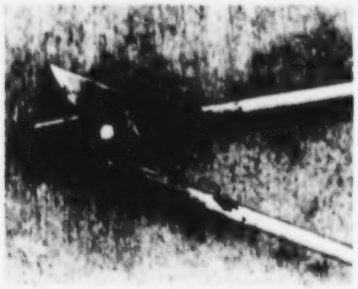
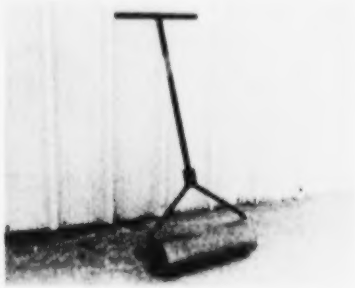
R. Can cutter



1. Splitting plant material containers open
2. Makes removal of root mass easier

S. Roller



1. Firming soil, mulch, seed beds, and sod
2. Available as push or pull types
3. Designed to be filled with sand or water for weight

INFORMATION SHEET

T.	Ax	1. Chopping woody plants 2. Splitting wood 3. Clearing brush 4. Available with single or double edges (bits)

U.	Sledgehammer	1. Driving stakes 2. Installing edgings 3. Heavy duty hammering

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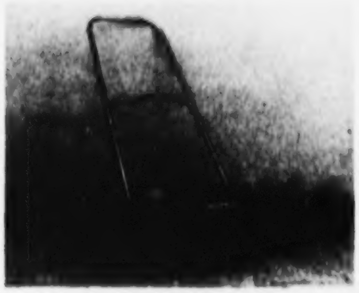
V.	Lawn sweeper	1. Picking up fallen leaves, twigs, and grass clippings 2. Use on smooth, level ground



(NOTE: There are many other types of specialty hand tools not covered here such as those used in greenskeeping, tree removal, and pest control. Also new hand tools and improvements on hand tools are added to the market every year. You should become familiar with tools used by professionals in your area.)

INFORMATION SHEET

XXIII. **General procedures for maintaining hand tools**

A. Remove soil and vegetation from tools as they accumulate.

(NOTE: Be sure to clean open sockets or hollows especially in the back of tool blades.)

B. Remove rust from metal parts when they appear. (Job Sheet #2)

C. Condition weathered wooden handles with linseed oil so they can be used longer. (Job Sheet #3)

D. Sharpen cutting edges of tools as needed. (Job Sheet #4)

E. Tighten screws, bolts, handles, and heads on tools as they become loose.

F. Replace handles as needed. (Job Sheet #5)

G. Always return tools and materials to their proper storage places and in their proper condition—clean and dry.

XXIV. **Procedures for properly storing tools for the winter**

A. Wash all tools to remove soil, vegetation, chemicals, and let air dry.

B. Lubricate movable parts and apply penetrating oil to metal surfaces.

C. Tighten loose screws, bolts, heads, and handles.

D. Replace and repair broken or bent parts.

E. Clean and apply linseed oil to wood handles.

F. Sharpen dull cutting edges.

G. Place tools in dry, clean area on proper racks or hangers.

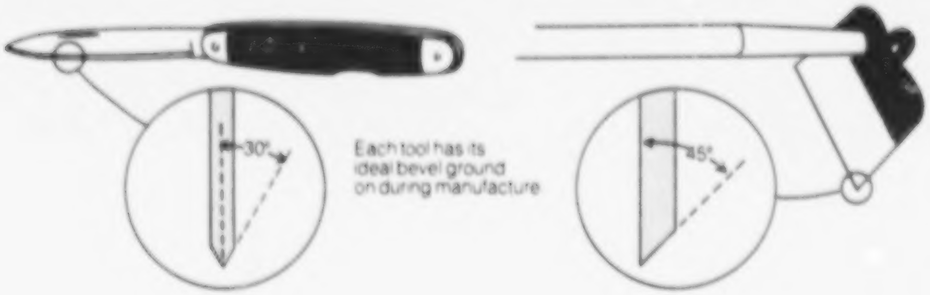
XXV. **Techniques for sharpening tools**

A. Decide if a tool should be sharpened.

B. Remove as little metal as possible.

INFORMATION SHEET

C. Follow the existing bevel edge of the tool blade.



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(NOTE: The smaller the angle, the sharper the edge.)

(CAUTION: Very sharp edges will nick, bend, and dull easily.)

D. Select the proper sharpening tool.

1. Grinders allow sharpening but are not good for beveling fine edges. Use on mower blades and axes.

2. Files remove metal quickly for medium sharp edges. Use on spades and hoes but not on shears or knives.

   (NOTE: Files are available in several coarsenesses. Coarse files can remove a great deal of metal quickly. Smooth files are for small burrs.)

3. Whetstones remove metal for very sharp edges. Use on knives, shears, and very small edge surfaces.

XXVI. **Safety precautions when using hand tools**

A. Do not leave tools on the ground near work site where they may become covered and stepped on. While working on a project, lay tools down with the tines facing the ground. Tines facing up on rakes or cultivators can be very dangerous!

B. Keep the work site neat as clutter allows accidents to happen.

C. Work at a steady, relaxed pace rather than hurrying.

D. Always tighten loose tool heads before use, and check periodically during use.

INFORMATION SHEET

E. Do not use metal or wood tools near electric lines.

F. Do not use the wrong tool for the job.

(NOTE: The most common violation of this rule is using a shovel or spade as a pry bar.)

G. Do not overload a wheelbarrow.

(NOTE: Unstable and overloaded wheelbarrows are hard to push and can topple easily. Always set the wheelbarrow down when you feel the load beginning to fall. Also do not walk too close to wheelbarrows operated by others.)

H. Do not carry hand pruners in your pants pocket.

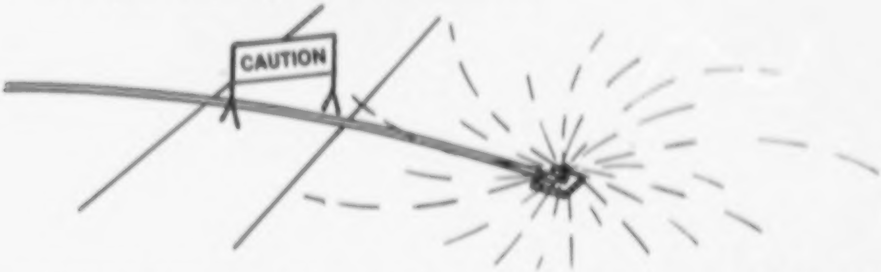
I. Do not twist pruners or loppers while cutting because you can damage both the plant and the tool.

J. Locate all utility (underground and aboveground) lines and pipes before using tools that can cut or damage these lines.

K. Wear work clothes approved by your supervisor. Clothing should protect you from the environment and job hazards and be appropriate for work situations.

L. Place caution signs near the site to warn traffic while work is being done.

Example: Watering hose across sidewalk



M. Securely cover an unfinished work site and place caution signs if it must be left unattended.

HAND TOOLS
UNIT II

JOB SHEET #1 — USE HAND TOOLS PROPERLY

A. Tools and materials

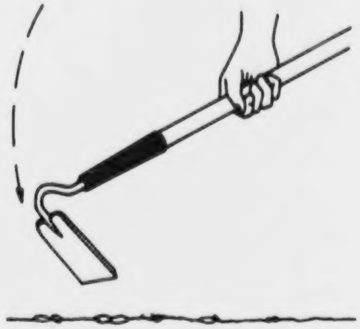
   1. Hoe
   2. Garden rake
   3. Lawn (leaf) rake
   4. Pick, mattock, or sledgehammer
   5. Post hole digger
   6. Trowel
   7. Hand pruner or shears
   8. Pole pruner
   9. Wheelbarrow

B. Procedure

   1. Using a hoe

      a. Cultivate with a hoe using a chopping motion to break and move the soil.

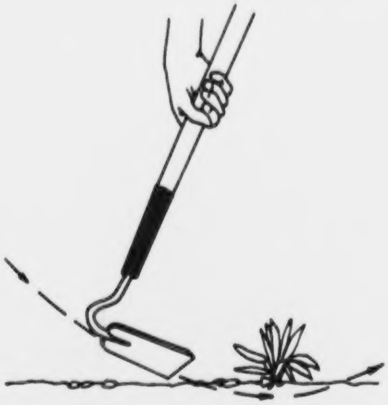
FIGURE 1



JOB SHEET #1

b. Weed with a hoe by pulling the hoe toward you and cutting off the plant just below the ground level.

FIGURE 2



c. Collect and dispose of all weeds and debris before leaving work site. Do not remove usable soil.

d. Select a handle long enough to prevent unnecessary bending.

e. Keep hoes sharp as dull hoes will bounce off of compacted soil surfaces.

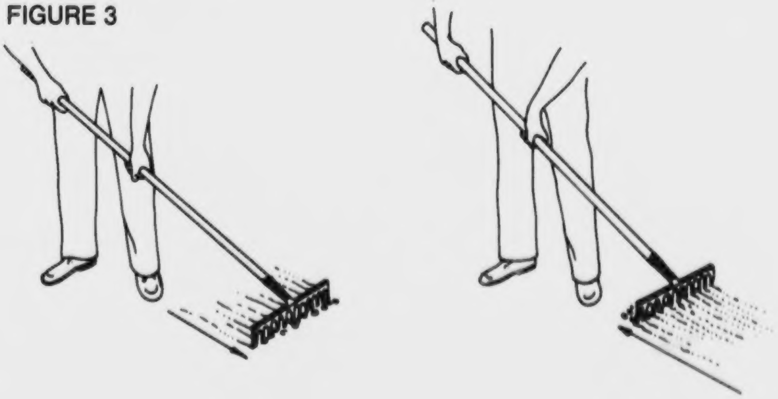
2. Using rakes

a. Use front hand to hold the rake and the other hand to move it back and forth.

b. Turn head over for smoothing the soil.

CAUTION: Never lay the rake flat on the ground where it can be stepped on or tripped over.)

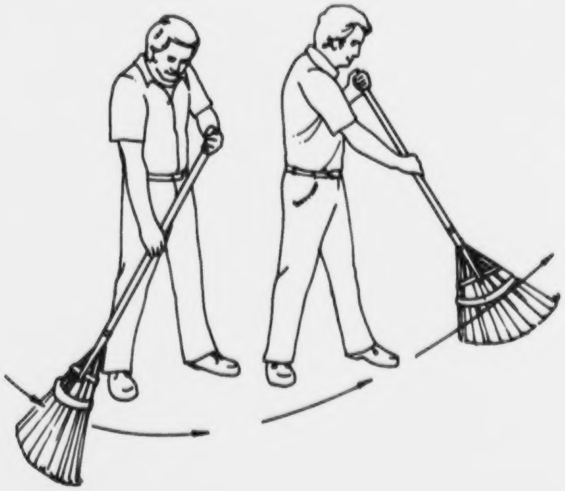
FIGURE 3



JOB SHEET #1

c. Use a lawn rake like a broom with a sweeping rather than a pulling motion.

FIGURE 4



d. Select a rake with a handle length (height) which is comfortable for you to use.

e. Store polypropylene rakes indoors to slow the eventual deterioration caused by the sun.

JOB SHEET #1

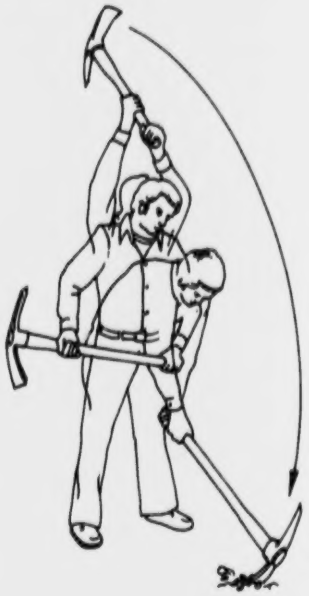
3. Using a pick, mattock, or sledgehammer

   a. Raise tool over your head and force it downward.

   (CAUTION: Watch out for fellow workers and nearby obstacles.)

   b. Use the weight of the tool head to make the downward thrust more powerful.

   FIGURE 5



   c. Select a handle and head weight appropriate for your size.

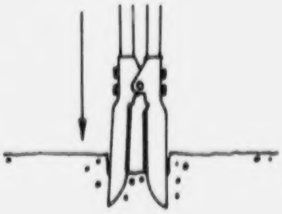
JOB SHEET #1

4. Using a post hole digger

   a. Grasp both handles and use a sharp downstroke into the hole position.

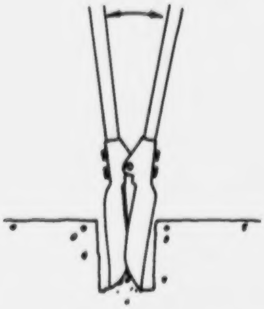
   (CAUTION: Watch your knuckles.)

   FIGURE 6



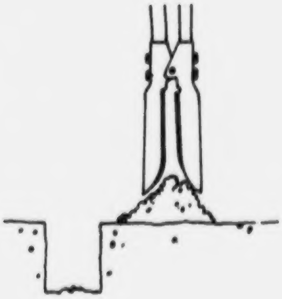
   b. Spread the handles apart to grasp the soil.

   FIGURE 7



   c. Lift out and close the handle to release the soil

   FIGURE 8

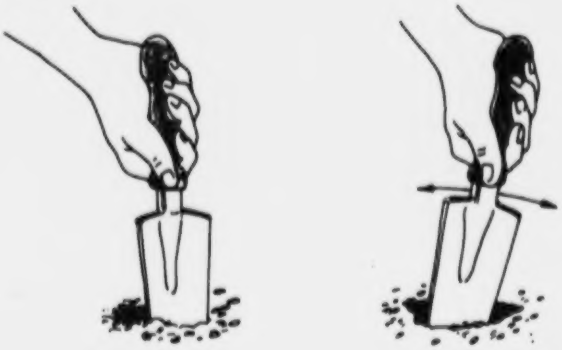


JOB SHEET #1

5. Using a trowel

   a. For transplanting seedlings push trowel straight down into tilled soil, and move the trowel back and forth to create a hole for the seedling.

   FIGURE 9



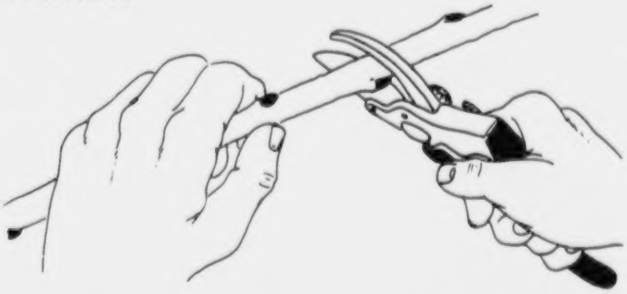
   b. Use narrow blades for weeding, and broad blades for moving more soil quickly during planting.

   (NOTE: Colorful handles are easier to find after the job is completed. The tang-and-ferrule on a trowel tends to loosen with use.)

6. Using hand pruners or shears

   a. Use hand pruners to cut live wood up to ¾″ thick.

   FIGURE 10



   b. Gently pull downward on the end to be removed. This will ease the binding.

   c. Do **not** twist the pruners while cutting.

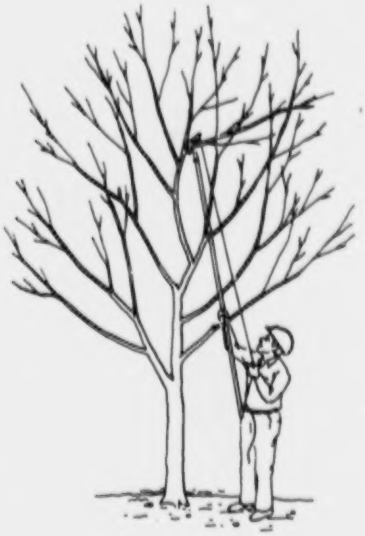
   d. Do **not** use hand pruners on wood that is too dry or too thick. If you can't make the cut easily with one hand, use a lopper or saw.

JOB SHEET #1

7. Using a pole pruner

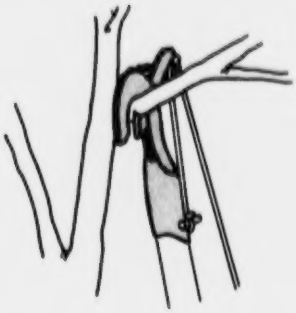
    a. Put the hook over the branch you want to cut.

    FIGURE 11



    b. Pull the rope or lever to cut the branch. Wrap the cord once around the pole to prevent bowing of the pole.

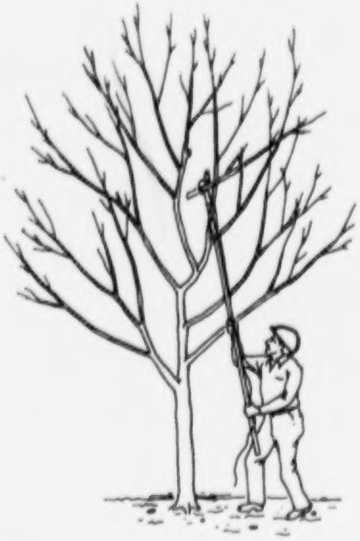
    FIGURE 12



JOB SHEET #1

c. Use the hook on the pruner to pull the cut branch from the tree.

FIGURE 13



8. Using a wheelbarrow

   a. Do not overload a wheelbarrow.

   b. Place the load over the front wheel.

   c. Lift the handles by keeping your back straight and bending your knees. This allows the leg muscles to lift the load instead of your back muscles.

      (NOTE: Do not lift **too** high because the front bar of the wheelbarrow can catch on objects and you can loose your balance.)

   d. If the wheelbarrow begins to fall to the side, set it down immediately and back away from the handles.

   e. Do not bounce a loaded wheelbarrow off a curb. This can damage the bearings. Use a ramp instead.

9. Clean all tools and return to their correct storage areas.

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HAND TOOLS
UNIT II

JOB SHEET #2 — REMOVE RUST FROM TOOLS

A. Tools and materials

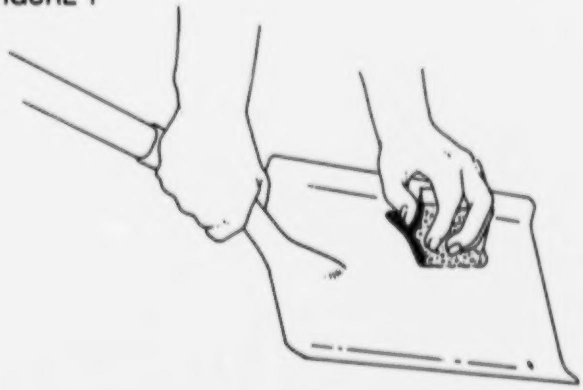
1. Rusty tools
2. Wire brush
3. Vise
4. Steel wool or sandpaper
5. Hand drill with wire brush attachment or grinder
6. Chemical rust removers
7. Absorbent clean cloths or paper
8. Penetrating oil
9. Protective goggles and gloves

B. Procedure

(NOTE: This procedure would not be necessary if everyone stored the tools correctly—clean and dry.)

1. Scrape off excess soil and loose rust with a wire brush.
2. Remove adhering rust. Several methods may be used.
    a. Scrub with steel wool or sandpaper.

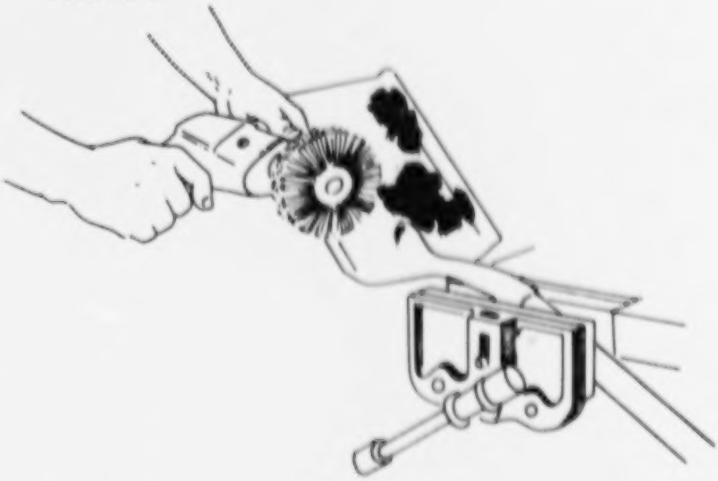
FIGURE 1



JOB SHEET #2

b. Secure tools in vise, put on protective goggles, and use a wire brush wheel attached to a hand drill or a grinder to remove rust.

FIGURE 2



3. Put on protective goggles and gloves. Then coat heavy rust with chemical rust removers.
4. Soak for length of time recommended by manufacturer.
5. Wipe off chemical rust remover with a wire brush or sandpaper.
6. Wipe metal surface with absorbent clean cloth or paper.
7. Apply penetrating oil to the metal surface.
8. Return tools to correct storage areas.

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HAND TOOLS
UNIT II

JOB SHEET #3 — CONDITION WEATHERED WOODEN HANDLES

A. Tools and materials

1. Tool with weathered wooden handle
2. File and handle or coarse sandpaper
3. Rags
4. Boiled linseed oil

B. Procedure

1. Remove splinters with a file or coarse sandpaper.

   (CAUTION: Always use a handle on the file to avoid injury.)

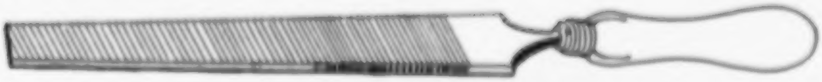
2. Wipe away sawdust and loose splinters with a rag.
3. Apply boiled linseed oil to dry handle with a clean rag.
4. Place handle in a warm location until oil soaks completely into wood.
5. Apply a second coat of linseed oil.
6. Let handle set for 24 to 48 hours as recommended by instructor.
7. Wipe off excess oil leaving a very light film on handle.
8. Return tools to their correct storage areas.

HAND TOOLS
UNIT II

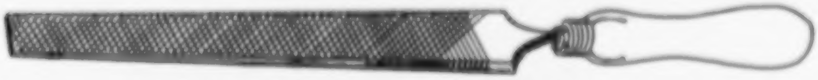
JOB SHEET #4 — SHARPEN A HOE

A. Tools and materials

1. Dull hoe
2. File with handle



Single Cut — for finish filing



Double Cut — for rough filing

3. Vise
4. Wire brush
5. Penetrating oil
6. Clean cloth

B. Procedure

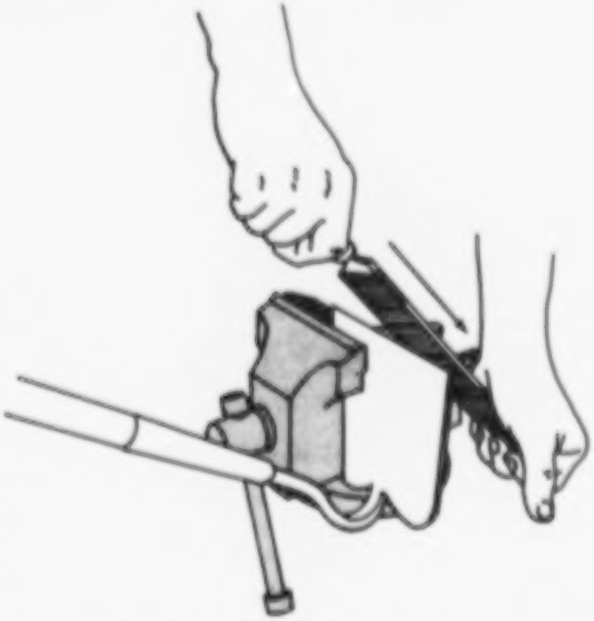
1. Place hoe with blade up in a vise.
2. Remove all dirt and rust from hoe.
3. Check condition of file to make sure it can be used for filing (not slick).

   (CAUTION: Always use a handle on the file to avoid injury.)
4. Place the file on the blade at the same angle as the existing beveled edge.

JOB SHEET #4

5. Push the file away and downward along beveled edge across the width of the blade.

FIGURE 1



6. At the end of the stroke, release all pressure.

7. Lift the file. DO NOT pull file towards you across the blade.

8. Repeat steps 4, 5, and 6, always beginning at the blade corner nearest you and filing the full width of the blade.

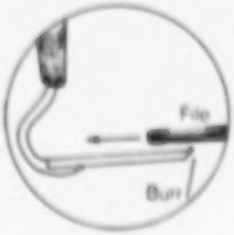
   (CAUTION: Never file repeatedly in one area of blade as this will damage the cutting edge.)

9. After sharpening the beveled edge, place the file flat against the nonbeveled edge of the blade.

JOB SHEET #4

10. Push file firmly across the edge to remove burrs or rough edges.

FIGURE 2



11. Remove the hoe from the vise.
12. Wipe with clean cloth to remove any metal particles.
13. Apply oil to the metal surface.
14. Clean file with paper or a wire brush to remove metal particles.
15. Store file in a file card.
16. Return tools and materials to the correct storage area.

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HAND TOOLS
UNIT II

JOB SHEET #5 — REPLACE A SHOVEL HANDLE

A. Tools and materials.

1. Shovel
2. New handle
3. Vise
4. Hammer
5. Nail
6. Pin or rivet
7. Electric drill and bits
8. Wood rasp

B. Procedure

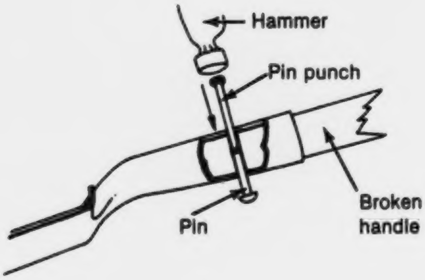
1. Place the shovel in a vise.

2. Center punch the middle of the rivet and twist drill out the rivet head.

   (NOTE: Power grinders may be used to remove the heads of rivets or pins. All safety precautions must be followed when using power tools. Use only after receiving proper instruction and with the permission of your instructor.)

3. Push the rivet out by hammering on a nail placed on the side without a head.

   FIGURE 1



JOB SHEET #5

4. Remove the old handle from the socket.

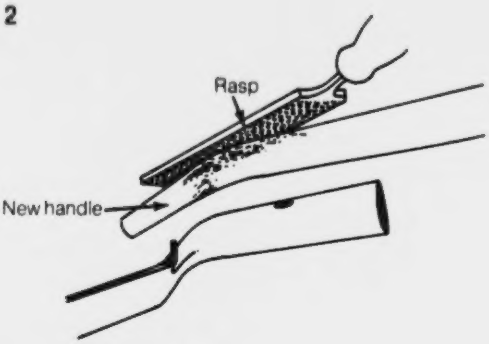
5. Check the fit of the new handle by inserting it into the socket.

   (NOTE: The new handle should have a curved end which matches the socket curve and extends to the end of the socket as needed. Usually the label will indicate the direction of the wood grain. The brand name of the handle should face up.)

6. Remove new handle.

7. Shape the handle with a wood rasp to fit the socket.

   FIGURE 2



8. Check the fit by inserting it into the socket.

9. Repeat steps 7 and 8 as necessary for correct fit.

   (NOTE: You may need to soak new handle to make it a little easier to work.)

10. Insert the new filed handle into the socket.

    (NOTE: You may also turn the new shovel assembly upside down [handle facing ground] and strike the handle on the ground to further drive the handle into the socket. Do not do this on "D" handles.)

11. Select the proper size bit to match existing rivet holes in the socket.

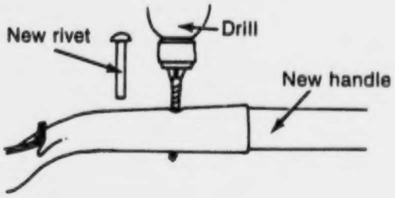
12. Secure the bit into the drill.

JOB SHEET #5

13. Drill rivet holes through the new handle.

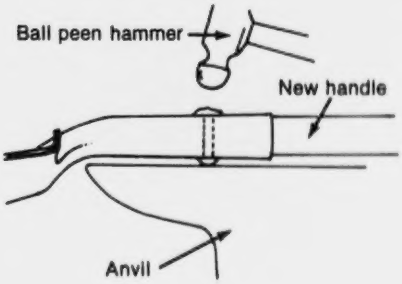
    (NOTE: Drill into new handle half the depth from both sides to ensure that the new rivet hole is in direct alignment with the socket rivet hole.)

    FIGURE 3



14. Insert the new rivet through the socket and new handle.
15. Remove the shovel from the vise.
16. Place shovel socket with new handle on a very hard surface with the rivet head down.

    FIGURE 4



17. Hammer to flatten the rivet end against the socket.
18. Dress rivet end with a single mil file so there are no burrs.
19. Brush off any metal particles or sawdust.
20. Apply oil to the metal surface and handle.
21. Return tools and materials to the correct storage area.

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HAND TOOLS
UNIT II

PRACTICAL TEST
JOB SHEET #1 — USE HAND TOOLS PROPERLY

STUDENT'S NAME ______________________________ DATE ____________

EVALUATOR'S NAME ____________________________ ATTEMPT NO. ______

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper tools and materials.	______	______
2. Properly used a hoe.	______	______
3. Properly used a rake.	______	______
4. Properly used a pick, mattock, or sledgehammer.	______	______
5. Properly used a post hole digger.	______	______
6. Properly used a trowel.	______	______
7. Properly used a hand pruner or shears.	______	______
8. Properly used a pole pruner.	______	______
9. Properly used a wheelbarrow.	______	______
10. Checked in/put away tools and materials properly.	______	______
11. Cleaned the work area.	______	______
12. Practiced safety rules throughout procedure.	______	______

EVALUATOR'S COMMENTS: ____

____

JOB SHEET #1 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:				
Tools were not damaged	4	3	2	1
Work was efficient	4	3	2	1

EVALUATOR'S COMMENTS: ______________________________

____

PERFORMANCE EVALUATION KEY

4 — Skilled — Can perform job with no additional training.
3 — Moderately skilled — Has performed job during training program; limited additional training may be required.
2 — Limited skill — Has performed job during training program; additional training is required to develop skill.
1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

HAND TOOLS
UNIT II

PRACTICAL TEST
JOB SHEET #2 — REMOVE RUST FROM TOOLS

STUDENT'S NAME ______________________________ DATE ____________

EVALUATOR'S NAME ____________________________ ATTEMPT NO. ______

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper tools and materials.	______	______
2. Scraped off excess soil and loose rust.	______	______
3. Scrubbed tools with steel wool, sandpaper, wire brush attachment on drill, or grinder.	______	______
4. Coated tool with rust removers.	______	______
5. Soaked tool as required.	______	______
6. Wiped off rust removers.	______	______
7. Applied penetrating oil to metal surface.	______	______
8. Checked in/put away tools and materials properly.	______	______
9. Cleaned the work area.	______	______
10. Practiced safety rules throughout procedure.	______	______

EVALUATOR'S COMMENTS: ____

____

JOB SHEET #2 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:

	4	3	2	1
No rust is evident				
	4	3	2	1
Metal surface is clean and properly oiled				

EVALUATOR'S COMMENTS: ______________________________

____

PERFORMANCE EVALUATION KEY

4 — Skilled — Can perform job with no additional training.
3 — Moderately skilled — Has performed job during training program; limited additional training may be required.
2 — Limited skill — Has performed job during training program; additional training is required to develop skill.
1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

HAND TOOLS
UNIT II

PRACTICAL TEST
JOB SHEET #3 — CONDITION WEATHERED WOODEN HANDLES

STUDENT'S NAME ______________________________ DATE ____________

EVALUATOR'S NAME ____________________________ ATTEMPT NO. ______

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper tools and materials.	______	______
2. Scraped off splinters.	______	______
3. Applied boiled linseed oil to handle.	______	______
4. Allowed oil to soak in.	______	______
5. Applied second coat of linseed oil.	______	______
6. Allowed handle to set as required.	______	______
7. Wiped off excess oil.	______	______
8. Checked in/put away tools and materials properly.	______	______
9. Cleaned the work area.	______	______
10. Used proper tools correctly.	______	______
11. Practiced safety rules throughout procedure.	______	______

EVALUATOR'S COMMENTS: ____

____

JOB SHEET #3 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:				
Handle is free of splinters	4	3	2	1
Handle is smooth and well oiled	4	3	2	1

EVALUATOR'S COMMENTS:

PERFORMANCE EVALUATION KEY

4 — Skilled — Can perform job with no additional training.
3 — Moderately skilled — Has performed job during training program; limited additional training may be required.
2 — Limited skill — Has performed job during training program; additional training is required to develop skill.
1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

HAND TOOLS
UNIT II

PRACTICAL TEST
JOB SHEET #4 — SHARPEN A HOE

STUDENT'S NAME ______________________________ DATE ____________

EVALUATOR'S NAME ____________________________ ATTEMPT NO. _____

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper tools and materials.	_____	_____
2. Placed hoe securely in vise.	_____	_____
3. Filed down and away from student.	_____	_____
4. Filed across the width of the blade with each stroke.	_____	_____
5. Never pulled file towards the student.	_____	_____
6. Filed off burrs.	_____	_____
7. Oiled hoe.	_____	_____
8. Cleaned file.	_____	_____
9. Checked in/put away tools and materials properly.	_____	_____
10. Cleaned the work area.	_____	_____
11. Used proper tools correctly.	_____	_____
12. Performed steps in a timely manner. (___hrs. ___min. ___sec.)	_____	_____
13. Practiced safety rules throughout procedure.	_____	_____
14. Provided satisfactory responses to questions asked.	_____	_____

EVALUATOR'S COMMENTS: ____

____

JOB SHEET #4 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:

Kept the existing beveled edge	4	3	2	1
Obtained a smooth, even edge	4	3	2	1
Obtained a sharp edge	4	3	2	1

EVALUATOR'S COMMENTS: ______________________________

____

PERFORMANCE EVALUATION KEY

4 — Skilled — Can perform job with no additional training.
3 — Moderately skilled — Has performed job during training program; limited additional training may be required.
2 — Limited skill — Has performed job during training program; additional training is required to develop skill.
1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

HAND TOOLS
UNIT II

PRACTICAL TEST
JOB SHEET #5 — REPLACE A SHOVEL HANDLE

STUDENT'S NAME ______________________________ DATE ____________

EVALUATOR'S NAME ____________________________ ATTEMPT NO. ______

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper tools and materials.	______	______
2. Placed shovel securely in vise.	______	______
3. Removed old rivet head.	______	______
4. Shaped the new handle to fit the socket.	______	______
5. Drilled new rivet hole.	______	______
6. Inserted rivet.	______	______
7. Secured rivet properly.	______	______
8. Checked in/put away tools and materials properly.	______	______
9. Cleaned the work area.	______	______
10. Used proper tools correctly.	______	______
11. Performed steps in a timely manner. (___hrs. ___min. ___sec.)	______	______
12. Practiced safety rules throughout procedure.	______	______
13. Provided satisfactory responses to questions asked.	______	______

EVALUATOR'S COMMENTS: ____

____

JOB SHEET #5 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:

New handle is tight and secure	4	3	2	1
New handle properly fits socket	4	3	2	1
Wood grain of handle is correct in relationship to blade	4	3	2	1

EVALUATOR'S COMMENTS: ____

____

PERFORMANCE EVALUATION KEY

4 — Skilled — Can perform job with no additional training.
3 — Moderately skilled — Has performed job during training program; limited additional training may be required.
2 — Limited skill — Has performed job during training program; additional training is required to develop skill.
1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

HAND TOOLS
UNIT II

TEST

NAME ______________________________ SCORE ______________

1. Match the terms on the right with the correct definitions.

_____a. A rough edge left on metal

_____b. Hammering and compressing steel making it more dense, uniform, and therefore, stronger

_____c. Condition resulting from forcing pruning tools to cut through limbs by twisting tool back and forth

_____d. Position of a shovel or spade blade in relation to the handle

1. Forging
2. Sprung
3. Burr
4. Degree of cant
5. Sharpening

2. List five considerations in choosing hand tools for particular jobs.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

3. Life five variations of hand tool construction.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

TEST

4. Select true statements describing characteristics of **quality** tools by placing a "T" next to the true statements and an "F" by the false statements.

_____a. Metal heads are made of galvanized aluminum.

_____b. Heads are attached tightly by closed socket.

_____c. Handles are made of aluminum.

_____d. Grains of wooden handles should run crosswise to the force exerted on the tool.

_____e. Reinforced tool handles and heads are meant for heavy use.

_____f. Saw teeth are not beveled.

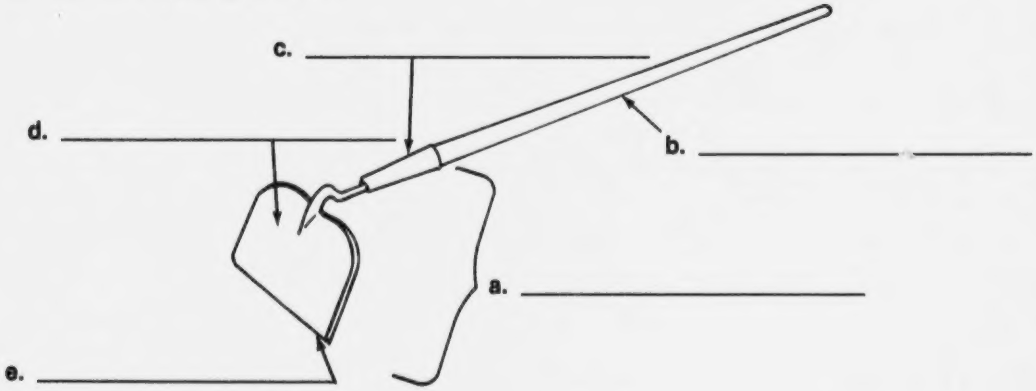
_____g. Narrow tires on carts and wheelbarrows are best for use on turf.

_____h. All moving parts work smoothly.

_____i. Cutting edges have many burrs.

_____j. All screws and bolts are placed correctly and securely.

5. Label the parts of a hoe.



6. Match the types of hoes on the right with their uses.

_____a. Chopping weeds and small brushy shrubs; tough jobs

_____b. Weeding by uprooting the whole plant; making rows

_____c. Weeding by cutting off the tops of plants

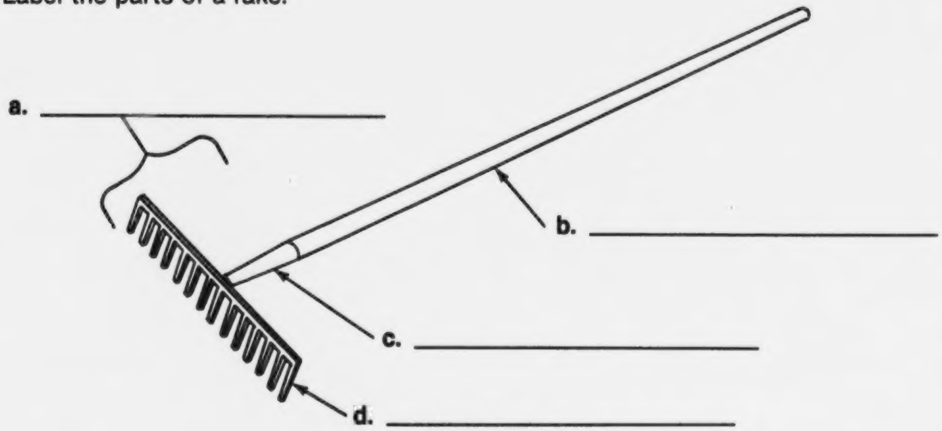
_____d. Weeding by moving back and forth cutting both directions

_____e. Loosening and moving light soil, general weeding

1. General garden hoe
2. Grading hoe
3. Scuffle hoe
4. Triangle hoe
5. Push hoe

TEST

7. Label the parts of a rake.



8. Match the types of rakes on the right with their uses.

_____a. Sweeping or raking debris, leaves, and clippings without damaging turf

_____b. Removing matted materials; has cutting blades or curved tines

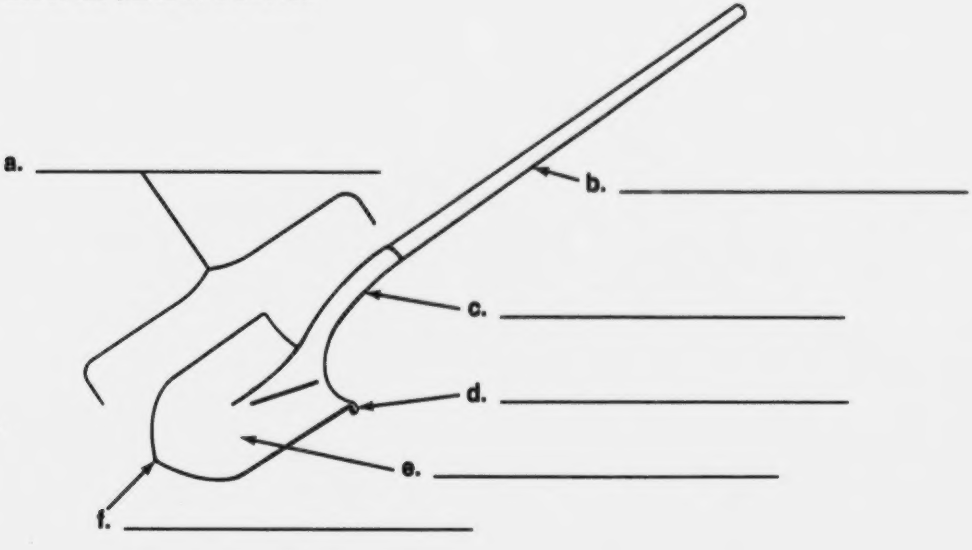
_____c. Breaking clods; 13-16" wide head

_____d. Raking heavy soil; flexible head

_____e. Breaking up and spreading soft soil; very wide head (25-30")

1. Flathead rake
2. Bowhead rake
3. Leveling or grading rake
4. Thatching rake
5. Leaf or broom rake

9. Label the parts of a shovel.

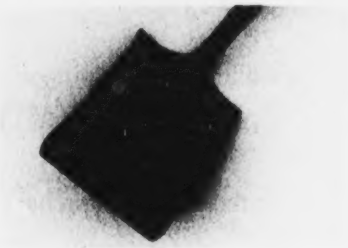


TEST

10. Identify the types of shovels below.

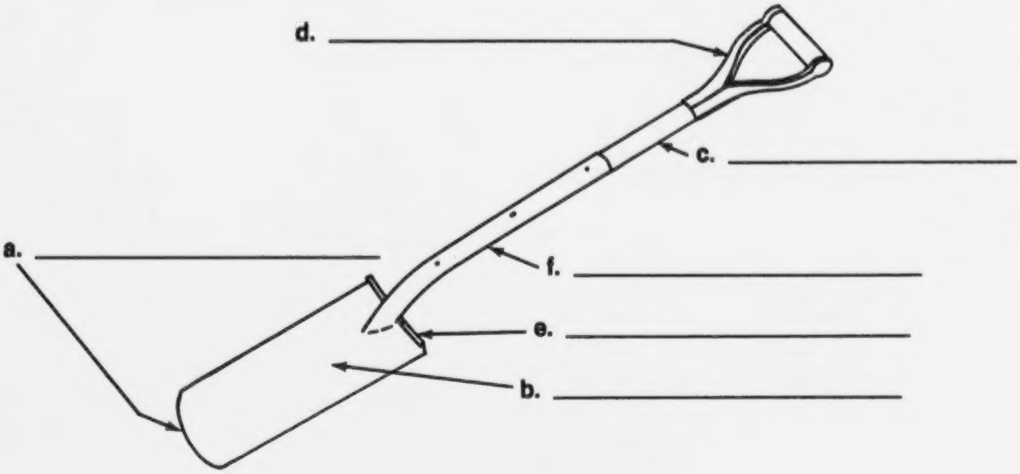
a. ______________________________

b. ______________________________



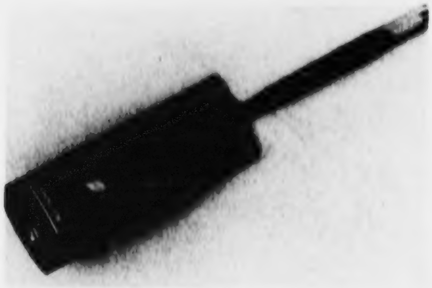
c. ______________________________

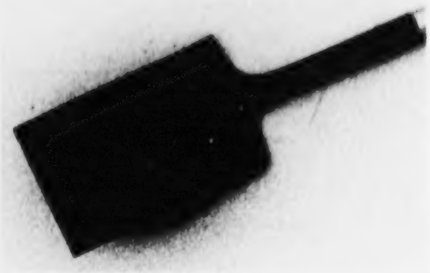
11. Label the parts of a spade.



TEST

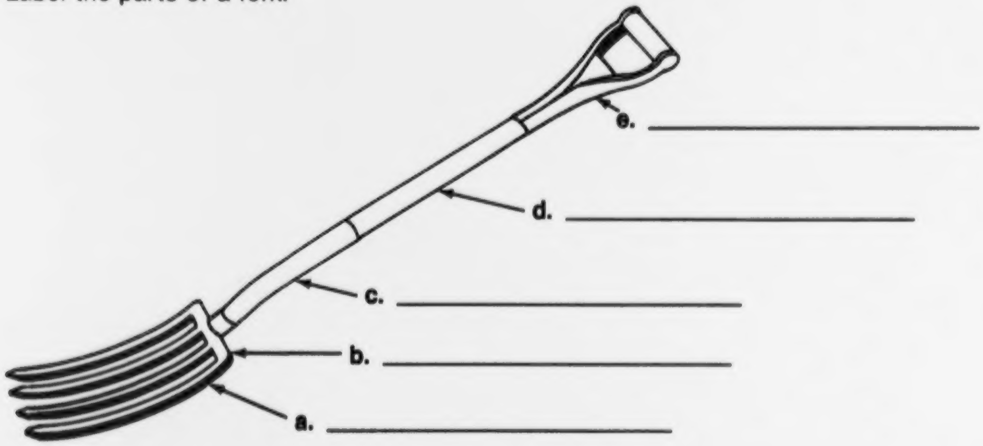
12. Identify the types of spades below.





a. ______________________________ b. ______________________________

13. Label the parts of a fork.



14. Match the types of forks on the right with their uses.

_____a. Raking debris from under shrubs; deep cultivating; has 4-5 tines bent at sharp angle

_____b. Lifting and moving compost; has multiple, curved tines

_____c. Digging and lifting heavy soils; has 3-4 thick tines

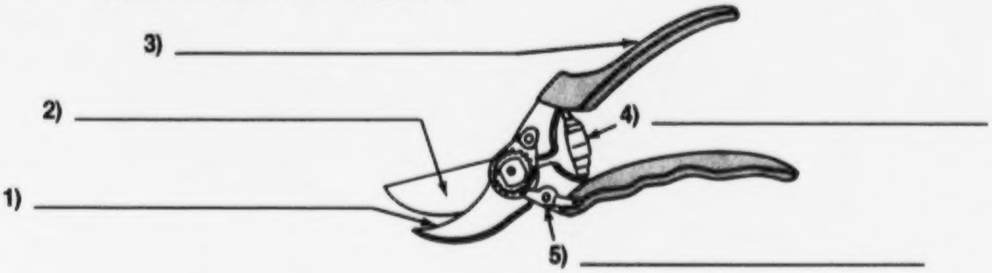
_____d. Lifting or moving loose materials; mulching; has 4-5 long, tapered tines

1. Heavy and standard garden forks
2. Manure fork
3. Scoop fork
4. Tine cultivator/potato fork

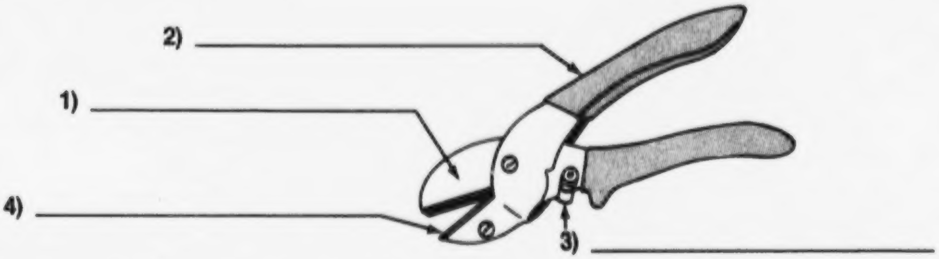
TEST

15. Label the parts of hand pruners.

    a. Bypass blade (scissor cut) pruner



    b. Anvil blade pruner



16. Distinguish between the types of hand pruners by placing an "X" next to the uses or characteristics of a bypass blade pruner.

    _____a. Cutting in narrow spaces

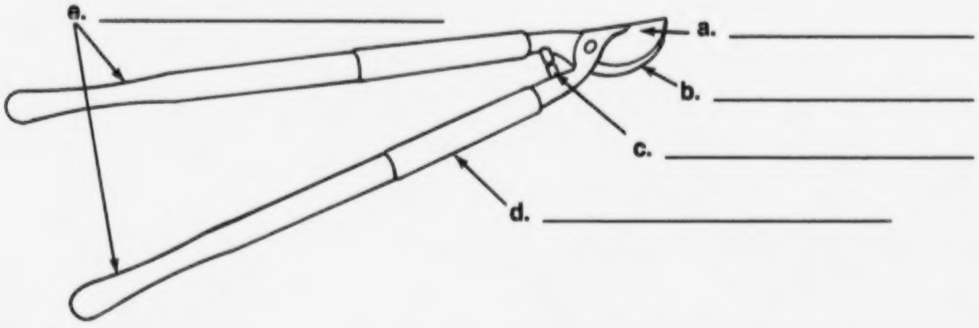
    _____b. Cutting in open spaces

    _____c. Cutting very close to main limb

    _____d. Preferred by professionals

    _____e. Can crush stems

17. Label the parts of a bypass type lopper.



TEST

18. Match the types of loppers and pole pruners on the right with their uses.

_____a. Cutting in narrow spaces

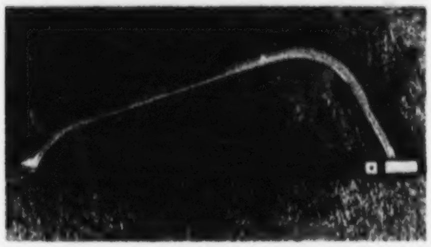
_____b. Cutting overhead branches

_____c. Cutting in open areas or wide crotch

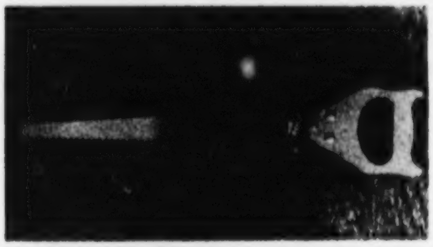
_____d. Cutting action is operated by a rope or metal rod through a pulley or lever system

1. Bypass lopper
2. Anvil lopper
3. Pole pruner

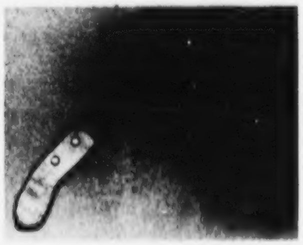
19. Identify the types of pruning saws below.



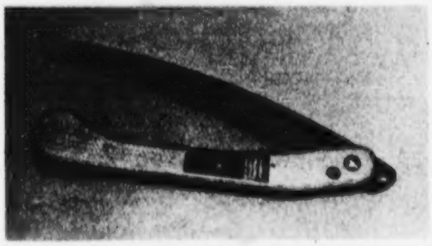
a. ____________________



b. ____________________



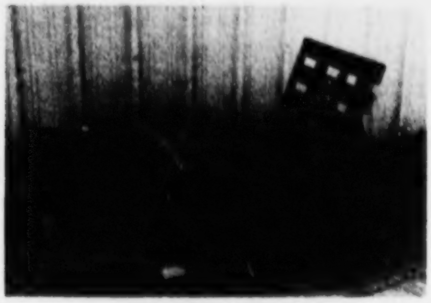
c. ____________________



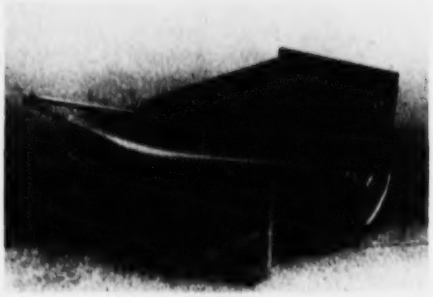
d. ____________________

TEST

20. Identify the types of wheelbarrows and carts below.



a. ______________________



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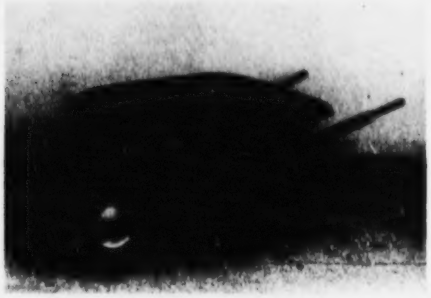
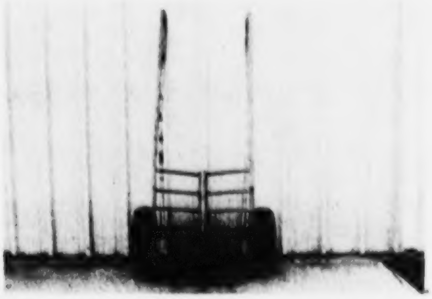
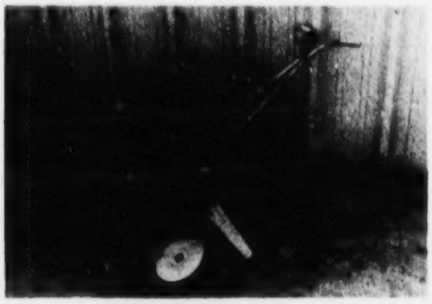


c. ______________________

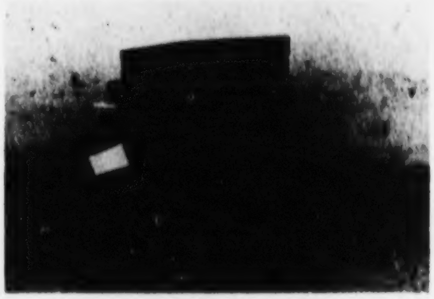


d. ______________________

21. Identify the types of spreaders below.



a. ______________________



b. ______________________

TEST

22. Match specialty tools listed on the right with their uses.

_____a. Chopping woody plants, splitting wood

_____b. Breaking up hard soil

_____c. Digging holes for fence or deck posts

_____d. Shaping shrubs and hedges

_____e. Cutting lawn edges flush to the drive and walk edges

_____f. Planting bedding plants, weeding, and digging furrows in soft soil

_____g. Loosening soil, raking, weeding, and mixing amendments

_____h. Dislodging heavy rocks, roots, etc.

_____i. Collecting soil samples and checking depth of soil moisture

_____j. Cutting especially high grass and weeds

_____k. Scooping snow and debris

_____l. Picking up small objects, trash, cans, and bottles without bending

_____m. Splitting plant material containers open to remove root mass easily

_____n. Firming soil, mulch, seed beds, and sod

_____o. Picking up fallen leaves, twigs, and grass clippings

_____p. Driving stakes

1. Ax
2. Can cutter
3. Clean-up caddy
4. Cultivator
5. Grass hook or whip
6. Grass shears
7. Hedge shears
8. Lawn sweeper
9. Mattock or pick
10. Post-hole digger
11. Pry bar
12. Roller
13. Rotary edger
14. Sledgehammer
15. Soil probe
16. Snow shovel
17. Trowels

TEST

23. Select true statements concerning general procedures for maintaining hand tools by placing an "X" next to the true statements.

_____a. Remove soil and vegetation from tools as they accumulate.

_____b. Allow rust to remain on metal parts.

_____c. Condition weathered wooden handles with soap so they can be used longer.

_____d. Sharpen cutting edges of tools as needed.

_____e. Replace handles as needed.

24. Select true statements concerning procedures for properly storing tools for the winter by placing an "X" next to the true statements.

_____a. Wash all tools to remove soil and vegetation before storing.

_____b. Allow moving parts to "freeze up" and rust.

_____c. Tighten loose screws, bolts, heads, and handles.

_____d. Replace and repair broken or bent parts.

_____e. Store handles in a fifty gallon container of water for the winter.

_____f. Do not sharpen dull cutting edges until early summer.

_____g. Place tools in a dry, clean area on proper racks or hangers.

25. Complete the following statements concerning techniques for sharpening tools by circling the correct words.

_____a. Remove as (**little, much**) metal as possible.

_____b. A knife (**should, should not**) be sharpened to the same bevel angle as a hoe.

_____c. Grinders are recommended for sharpening (**axes, shears**).

_____d. Whetstones are recommended for use in sharpening (**axes, shears**).

TEST

26. Select true statements describing safety precautions to follow when using hand tools by placing an "X" next to the true statements.

_____a. Leave tools any place that is convenient.

_____b. The work site should be cluttered at all times.

_____c. Always work hurredly to prevent accidents.

_____d. Always tighten loose tool heads before use and check periodically during use.

_____e. Do not use metal tools near electric lines.

_____f. Any tool is OK to use no matter what the job.

_____g. Do not overload the wheelbarrow.

_____h. Do not carry hand pruners in your pants pockets.

_____i. Wear appropriate work clothes.

_____j. Never mark or cover an unfinished work site when it must be left unattended.

_____k. Place caution signs near the site to warn traffic while work is being done.

_____l. Locate utility lines after cutting them.

(NOTE: If the following activities have not been accomplished prior to the test, ask your instructor when they should be completed.)

27. Demonstrate the ability to:

a. Use hand tools properly. (Job Sheet #1)

b. Remove rust from tools. (Job Sheet #2)

c. Condition weathered wooden handles. (Job Sheet #3)

d. Sharpen a hoe. (Job Sheet #4)

e. Replace a shovel handle. (Job Sheet #5)

HAND TOOLS
UNIT II

ANSWERS TO TEST

1. a. 3
   b. 1
   c. 2
   d. 4

2. Any five of the following:

   a. Type of soil
   b. Height and strength of the user
   c. Size of the job
   d. Handle length
   e. Right tool for the job
   f. Degree of cant
   g. How often the tool will be used

3. Any five of the following:

   a. Handle lengths
   b. Handle grips
   c. Handle materials
   d. Head attachment
   e. Head weight
   f. Head materials
   g. Reinforcement

4. a. F
   b. T
   c. F
   d. F
   e. T
   f. F
   g. F
   h. T
   i. F
   j. T

5. a. Head
   b. Handle
   c. Socket
   d. Blade
   e. Beveled edge

6. a. 2
   b. 4
   c. 3
   d. 5
   e. 1

ANSWERS TO TEST

7. a. Head
   b. Handle
   c. Socket
   d. Tines

8. a. 5
   b. 4
   c. 1
   d. 2
   e. 3

9. a. Head
   b. Handle
   c. Socket
   d. Step
   e. Blade
   f. Nose

10. a. Scoop shovel
    b. Round-nose shovel
    c. Square-nose shovel

11. a. Nose
    b. Blade
    c. Handle
    d. "D" handle grip
    e. Steps
    f. Socket and straps

12. a. Tree spade
    b. Garden spade

13. a. Tines
    b. Steps
    c. Socket
    d. Handle
    e. "D" handle grip

14. a. 4
b. 3
c. 1
d. 2

15. a. 1) Hook
2) Blade
3) Handle
4) Return spring
5) Locking device

b. 1) Blade
2) Handle
3) Locking device
4) Anvil

16. a, c, d

17. a. Blade
b. Hook
c. Rubber bumper cushions
d. Socket or tang-and-ferrule
e. Handles

18. a. 1
b. 3
c. 2
d. 3

19. a. Bow saw
b. Double-edged saw
c. Curved blade saw
d. Folding saw

20. a. Sod and tile barrow
b. Utility cart
c. All-purpose wheelbarrow
d. Nursery cart or "truck"

21. a. Drop spreader
b. Hand-held broadcast spreader

ANSWERS TO TEST

22.	a.	1	i.	15
	b.	9	j.	5
	c.	10	k.	16
	d.	7	l.	3
	e.	6 or 13	m.	2
	f.	17	n.	12
	g.	4	o.	8
	h.	11	p.	14

23. a, d, e

24. a, c, d, g

25.	a.	Little
	b.	Should not
	c.	Axes
	d.	Shears

26.	a.	F	g.	T
	b.	F	h.	T
	c.	F	i.	T
	d.	T	j.	F
	e.	T	k.	T
	f.	F	l.	F

27. Performance skills evaluated to the satisfaction of the instructor

LIGHT POWER EQUIPMENT
UNIT III

UNIT OBJECTIVE

After completion of this unit, the student should be able to safely operate and maintain light power equipment used in groundskeeping. Competencies will be demonstrated by completing the job sheets and the unit tests with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to light power equipment with the correct definitions.
2. Complete statements concerning general safety practices for power equipment.
3. Complete statements concerning electric safety practices for power equipment.
4. Complete statements concerning fuel safety practices for power equipment.
5. Identify light power equipment used in groundskeeping.
6. Complete statements concerning safety practices for using string trimmers, edgers, portable blowers, and hedge shears.
7. Complete statements concerning chain saw safety practices.
8. Select true statements concerning mower safety practices.
9. Select true statements concerning rotary tiller safety practices.
10. List power shredder safety practices.

OBJECTIVE SHEET

11. Complete statements concerning snowblower safety practices.

12. Complete statements concerning generator safety practices.

13. Select true statements concerning procedures for winterizing and storing light power equipment.

14. Demonstrate the ability to:

    a. Use a string trimmer. (Job Sheet #1)

    b. Use an edger. (Job Sheet #2)

    c. Use a walk-behind mower. (Job Sheet #3)

    d. Remove and replace a rotary mower blade. (Job Sheet #4)

    e. Use a vertical mower/dethatcher. (Job Sheet #5)

    f. Use a rear-tine tiller. (Job Sheet #6)

    g. Use a front-tine tiller. (Job Sheet #7)

LIGHT POWER EQUIPMENT
UNIT III

SUGGESTED ACTIVITIES

A. Obtain additional materials and/or invite resource people to class to supplement/reinforce information provided in this unit of instruction.

(NOTE: This activity should be completed prior to the teaching of this unit.)

B. Provide students with objective sheet.

C. Discuss unit and specific objectives.

D. Provide students with information sheet.

E. Discuss information sheet.

F. Provide students with job sheets.

G. Discuss and demonstrate the procedures outlined in the job sheets.

H. Integrate the following activities throughout the teaching of this unit:

   1. Demonstrate how to operate and sharpen a chain saw, blower, power shears, shredder, power sweep and vacuum, snow blower, sod cutter, and an aerator.
   2. Take the class to visit a groundskeeping business and observe the use of equipment, safety practices, and behavior of workers.
   3. Invite groundskeepers from different size firms to discuss their service and maintenance procedures on their equipment.
   4. Show and demonstrate safety equipment. Discuss common accidents to impress students with the importance of wearing their safety equipment.
   5. Obtain copies of safety product catalogs for each student.
   6. Obtain copies of operators manuals for various equipment for each student. (See supplemental resources for some manufacturers.)
   7. Invite your state extension agent who specializes in safety to speak to the class.
   8. Demonstrate how to restring a trimmer.
   9. Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas for improvement.

I. Give test.

J. Evaluate test.

K. Reteach if necessary.

RESOURCES USED IN DEVELOPING THIS UNIT

A. *Basic Gardening Illustrated*. Menlo Park, CA: Sunset Books, Lane Publishing Co., 1975.

B. Beard, Dr. James B. *How to Have a Beautiful Lawn*. College Station, TX: Beard Books, 1983.

C. Beard, James B. *Turfgrass: Science and Culture*. Englewood Cliffs, NJ: Prentice-Hall, Inc., 1973.

D. Hannebaum, Leroy G. *Landscape Operations: Management, Methods, and Material*. Reston, VA: Reston Publishing Company, 1980.

E. *How to Select, Use, and Maintain Garden Equipment*. San Francisco: Ortho Books, Chevron Chemical Co., 1981.

F. Ingels, Jack E. *Landscaping: Principles and Practices*. Albany, NY: Delmar Publishers Inc., 1987.

G. *Greenskeeping*, Instructional Materials Services, College of Agriculture, Pennsylvania State University, University Park, Pennsylvania. 1981.

H. Ingels, Jack E. *Ornamental Horticulture: Principles and Practices*. Albany, NY: Delmar Publishers Inc., 1985.

I. *Pruning Handbook*. Menlo Park, CA: Sunset Books, Lane Publishing Co., 1978.

J. Sprague, Howard B. *Turf Management Handbook*. Danville, IL: Interstate Printers and Publishers, Inc., 1982.

K. Turgeon, A. J. *Turfgrass Management*. Reston, VA: Reston Publishing Co., 1985.

L. Wilson, Scott. *Landscape Maintenance*. San Luis Obispo, CA: Vocational Education Productions, California Polytechnic State University, 1982.

SUGGESTED SUPPLEMENTAL RESOURCES

A. Safety Product Catalog

Direct Safety Company
P.O. Box 50050
Phoenix, Arizona 85076-0050

B. Tools and Supply Catalog

A.M. Leonard, Inc.
6665 Spiker Road
Piqua, Ohio 45356

SUGGESTED SUPPLEMENTAL RESOURCES

Edger — Black & Decker Inc.
U.S. Power Tools Group
10 North Park Drive
P.O. Box 798
Hunt Valley, MD 21030-0798

Trimmer — Poulan/Weed Eater
Division White Consolidated Industries, Inc.
Shreveport, Louisiana 71139-9329

Blower — Allegretti and Company
9200 Mason Ave.
Chatsworth, California 91311

Vacuum — Parker Sweeper Company
Box 720
Springfield, Ohio 45501

Chainsaw — Sachs-Dolmar Division
P.O. Box 7856
Shreveport, Louisiana 71137-8526

Generator — American Honda Motor Co., Inc.
Motorcycle and Power Products
Customer Relations Department Northwest Region
P.O. Box 30285
Portland, Oregon 97220
or
Customer Relations Department Southwest Region
P.O. Box 5406
Irving, Texas 75062

Rotary Tiller — Gilson Brothers Company
Box 152
Plymouth, Wisconsin 53073

Aerators — West Point Products Corporation
West Point, Pennsylvania

Mowers — Ryan Equipment Company
Outboard Marine Corp.
P.O. Box 82409
Lincoln, NE 68501

Extension Service Bulletins available from:

Cooperative Extension Service
Central Mailing Services
Oklahoma State University
Stillwater, OK 74078

#CR-12140882 — *Selecting the Proper Engine Oil*
#9430 — *Safe Chain Saw Operation*

LIGHT POWER EQUIPMENT
UNIT III

INFORMATION SHEET

I. **Terms and definitions**

A. Aerator — Device which punches out or slices small pieces of sod to reduce compaction and to admit air, water, and soil amendments

Examples: Vertical mower, core cultivator, spiker

B. Air cleaner — Filtering device for cleaning and removing dust from the air admitted to an engine

C. Blower — Tool used to blow leaves and clippings from paved surfaces other than by sweeping or washing

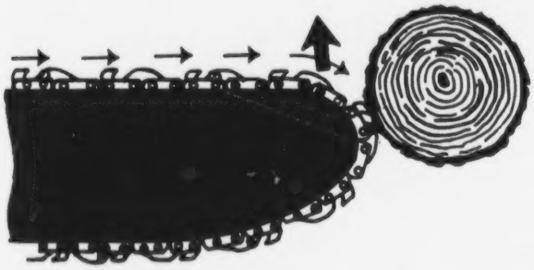
D. Chainsaw — Machine used to cut limbs and tree trunks

E. Four-cycle engine — An internal-combustion engine in which one piston stroke out of every four is a power stroke

F. Generator — Machine which converts mechanical energy into electrical energy

G. Hedge shears — Tool used to shape hedges and small shrubs by cutting small twigs and limbs

H. Kickback — Tendency for a chainsaw to jump back when the guide tip touches an object or when the wood closes in and pinches the chain in the cut



I. Rotary edger — Tool with rotary blades which cut and trench sod as the wheels roll along a paved surface next to the turf

(NOTE: Blades vary in size resulting in a clean edge trenched up to 4 inches deep.)

INFORMATION SHEET

J. Shredder — Machine which shreds or chops plant waste material to smaller, compost-size pieces

K. Sod cutter — Machine used to remove growing turf from established areas

L. String trimmer — Device that cuts succulent twigs, weeds, and grass by a whirling nylon line (string)

(NOTE: This string gradually wears away and is replaced manually, semi-automatically, or automatically.)

M. Tiller — Machine used in cultivating planting areas to a soil depth of 1" to 8"

N. Two-cycle engine — An internal-combustion engine in which every other piston stroke is a power stroke

O. Vacuum — Machine used to pick up debris such as clippings, leaves, and papers

II. **General safety practices for power equipment**

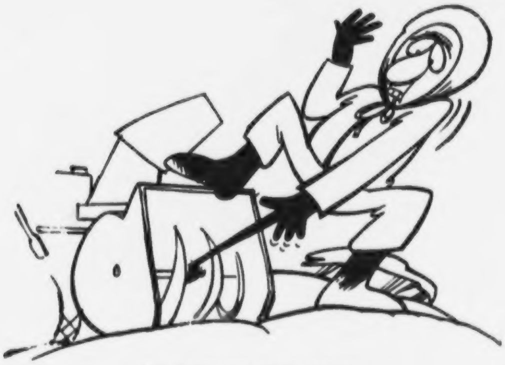
A. Read, understand, and follow the warnings and instructions in the operator's manual before using any tool.

B. Review operator manuals at the beginning of each season and as equipment is replaced by similar but newer models no matter how experienced you are.

C. Know how to **stop** and **start** equipment before operating.

D. Do not operate any equipment when you are tired, ill, or under the influence of alcohol, drugs, or medications.

E. Keep hands, feet, and clothing away from moving parts.



Courtesy of John Deere

INFORMATION SHEET

F. Always wear heavy, long pants, boots, and gloves.

G. Remove jewelry and secure loose clothing and long hair before using power equipment. These can become entangled in equipment.

H. Remove all sticks, wires, rocks, and foreign objects from the area before operating.

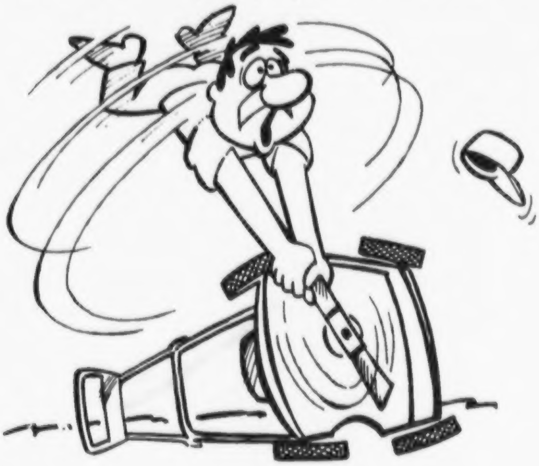
I. Keep people a safe distance from your work area.

J. Stop engine before cleaning, fueling, or making any adjustments.

    1. Disconnect extension cords from electrical sources.

    2. Disconnect spark plug wires of gasoline engines or remove plug.

    3. Make sure the spark plug wire cannot fall back against the plug.



Courtesy of John Deere

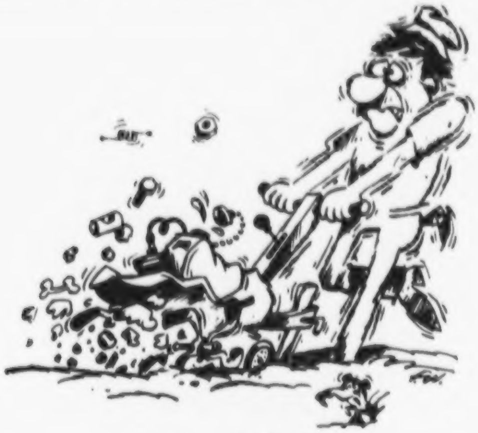
K. Never leave the engine running while unattended.

L. Keep all safety shields in place.

M. Never run an engine in an unventilated area.

INFORMATION SHEET

N. Keep all power equipment clean and properly maintained.



Courtesy of John Deere

O. Inspect every tool for damaged or loose parts before using it.

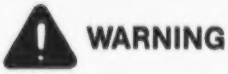
P. Keep handles free of oil and fuel.

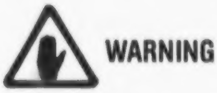
Q. Do not force a tool to operate at too fast a rate.

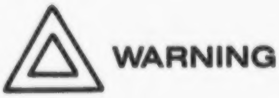
R. Use the right tool for the job.

S. Heed all warning signs.

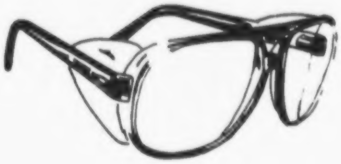
Examples:

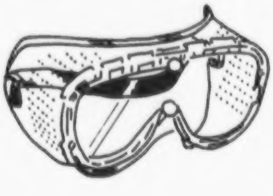


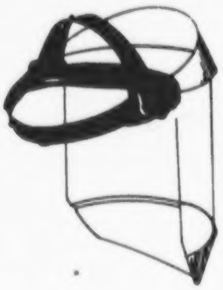




T. Wear safety goggles or face shields when operating equipment which can "throw" objects. Dust masks should also be worn when conditions are very dusty.

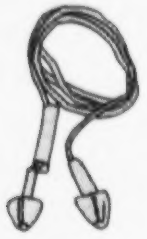




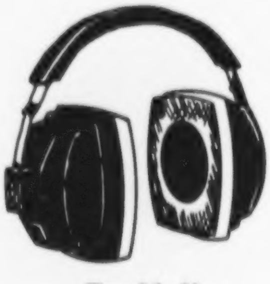


INFORMATION SHEET

U. Wear hearing protection when operating loud equipment, especially those having gasoline engines.



Ear Plugs



Ear Muffs

III. **Electric safety practices for power equipment**

A. Always use properly grounded plugs and cords.

B. Use only the voltage supply recommended for a tool.

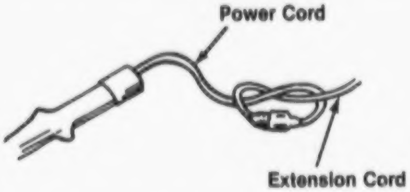
(NOTE: Required voltage information is usually printed on the equipment.)

C. Do not use near flammable liquids.

D. Do not use in snow or wet locations.

E. Use undamaged extension cords and electrical connectors designed for outdoor use.

(NOTE: Tie extension cord and attach to power cord as shown.)



F. Never carry an electric tool by the extension cord.

G. Use cords heavy enough to carry the current the full length of the cord.

H. Do not expose cords to heat, oil, or sharp edges.

I. Avoid body contact with a grounded conductor.

Examples: Metal pipes, fences

J. Do not touch the starter while connecting an extension cord.

INFORMATION SHEET

K. Unplug a tool when it is not in use.

L. Keep tool housing free of debris to prevent motor overheating.

M. Always unplug an electric tool from the power source, even if the motor is off, before servicing, transporting, or storing.

IV. **Fuel safety practices for power equipment**

A. Mix and pour fuels outdoors.

B. Use only fuel or fuel mixture recommended for each tool.

Example: Do not use gasoline in a diesel engine, or gasoline only in an engine requiring a gas/oil mix.

C. Never smoke while mixing and pouring fuels.

Courtesy of John Deere

D. Use only approved fuel containers.

E. Never store fuel indoors where fumes can be ignited by a flame or spark.

(NOTE: Sparks from an electric motor or a pilot light can ignite fumes from a gas can.)

F. Wipe up all spills on machinery and drives.

(NOTE: Fuel spills on turf will kill grass, and dissolve or discolor asphalt. Always move to a concrete drive or spread protective plastic sheeting before adding fuel.)

G. Move away from a spill area, wipe off excess fuel, and allow fuel to evaporate from equipment before starting the engine.

H. Never remove the gas cap or add fuel when the engine is running or hot.

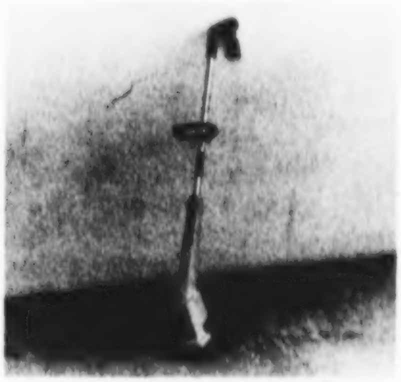
I. Always allow the engine to cool before transporting or storing a tool.

J. Empty the fuel tank before storing a tool.

INFORMATION SHEET

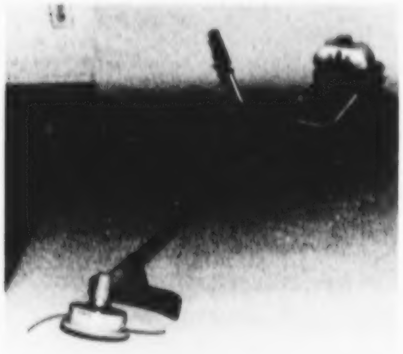
V. **Light power equipment used in groudskeeping** (Job Sheet #1—#7)

A. Electric string trimmer



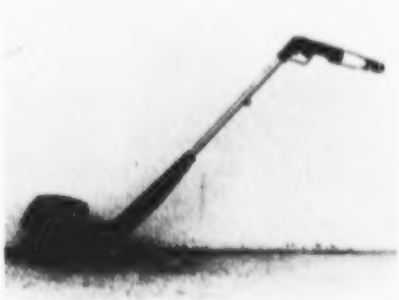
1. Light to medium cutting and edging
2. Restricted by cord length
3. Lightweight
4. Quiet running
5. Semiautomatic to automatic nylon feed

B. Gasoline string trimmer



1. Heavy cutting and edging
2. Needs more maintenance than other types
3. Heavier than other types
4. Optional exchange of nylon string for brush-cutter blade

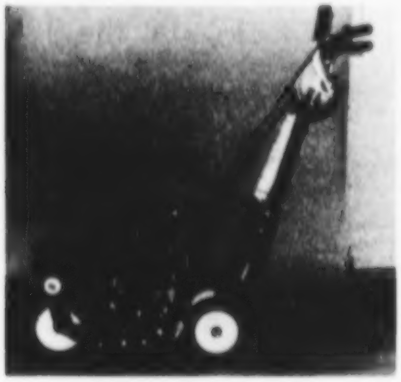
C. Electric edger



1. Used to edge along curbs and sidewalks
2. Lighter duty than gasoline models
3. Less maintenance than gasoline models
4. Limited by extension cord and availability of electric power

INFORMATION SHEET

D. Gasoline edger



1. Used to edge along curbs and sidewalks
2. Usually for heavy duty commercial use
3. Some models convert into trimmers

   (NOTE: Converting models are usually less durable.)
4. Require more maintenance than electric models

E. Hedge shears (electric shown)

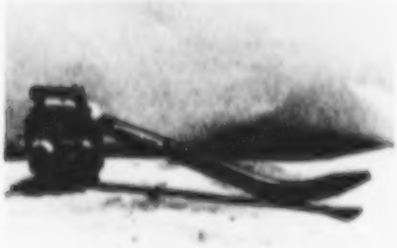
1. Used to shear and trim hedges
2. Available in electric or gasoline models.
3. Electric models are less powerful and lighter than gas models
4. Electric models are normally available with 12 to 16 inch bars
5. Gas models are available in 12 to 20 inch bar sizes with 2-cycle engines

F. Gasoline push blower

1. Used to blow leaves, light snow, and debris from areas
2. Blow water from tennis courts, walkways, pools

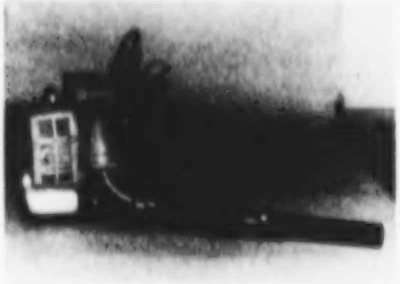
INFORMATION SHEET

G. Gasoline hand-held blower



1. Used to blow leaves, light snow, and debris from areas
2. Blow water from tennis courts, walkways, pools

H. Gasoline backpack blower



1. Used to blow leaves, light snow, and debris from areas
2. Blow water from tennis courts, walkways, etc

I. Electric chainsaw

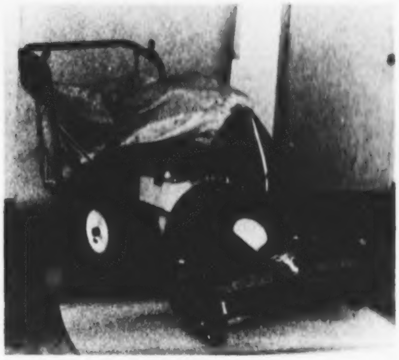
1. Used for light pruning, to cut small logs, heavy brush
2. Bars are 8" to 16" long
3. Quiet running
4. Cost less than gas engine
5. Easier to start
6. Limited mobility
7. Motors burn out easily; do not force (lug)
8. Primarily for homeowner use

INFORMATION SHEET

J. Gasoline chainsaw

1. Available in medium-duty sizes for home use to heavy-duty size for commercial lumber industry
2. Bars are 20" to 36" long
3. Used for all sizes of pruning jobs to complete tree removal
4. Portable

K. Vacuum sweeper



1. Used to remove leaves and trash from turf, sidewalks, and curb areas
2. Used to remove heavy thatch after vertical mowing
3. Available in various sizes

L. Gasoline rotary walk-behind mower

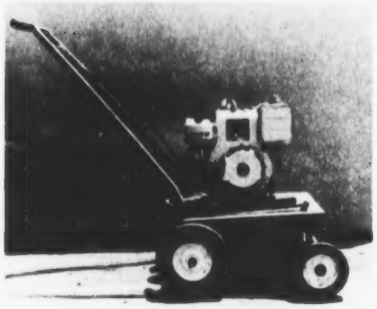
1. Used to mow utility turfs (turfs that do not require extremely high quality mowing)
2. More versatile than reel mower
3. Used to mow tall grass, tough seed stalks, and weeds
4. Available as 2 or 4 cycle engine
5. Self-propelled models are available.
6. Available with or without bagging capability

INFORMATION SHEET

M. Gasoline reel walk-behind mower

1. Used to mow turf when higher quality mowing is desired
2. Self-propelled models are available.
3. Available with and without bagging capability
4. Requires frequent blade sharpening

N. Dethatcher (power rake)



1. Used for removing thatch, light cultivation, light aeration, and breaking up cores after aerating
2. Adjustable depths

O. Aerator (vericutter) (vertical mower)—several types

1. Used to aerate when maximum aeration is required
2. Disrupts but does not destroy turf
3. Core cultivator type removes cores up to 3 inches deep and 0.25 to 0.75 inches in diameter
4. Spiker type penetrates turf to a depth of 1 inch
5. Slicer type has V-shaped knives that penetrate turf to a depth of 3 to 4 inches

INFORMATION SHEET

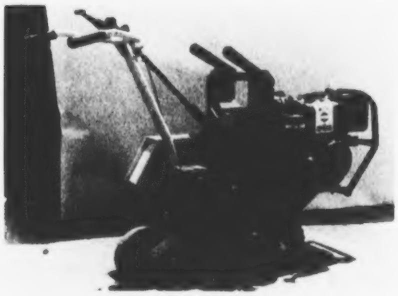
P. Front-tine rotary tiller

1. Used to cultivate soil to a depth of 1" to 6" in vegetable and flower beds
2. Chops mulch material
3. Used to rework previously tilled soil
4. Difficult to use on hard, rocky, or weedy ground
5. Less powerful than rear-tine models (light to medium duty)
6. Available in various sizes
7. Snowblower attachments available

Q. Rear-tine rotary tiller

1. Used to cultivate soil to a depth of 1" to 8"
2. Breaks untilled ground
3. Usually more powerful than front-tine models
4. Available in various sizes
5. Snowblower and snowplow attachments available
6. Bulky and hard to use in small areas

R. Sod cutter



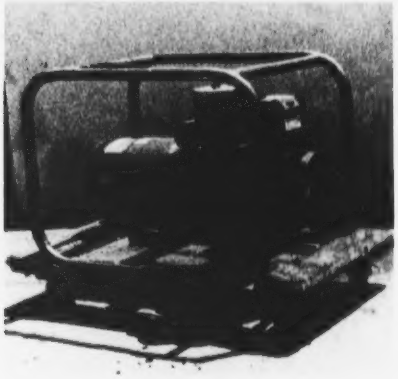
1. Used to cut sections of sod for patching damaged areas or starting new areas
2. Usual cutting widths are 12 to 18 inches with depths of ¼ to 2 ½ inches

INFORMATION SHEET

S. Shredder/Mulcher/Wood chipper

1. Used to shred plant waste materials such as twigs, branches, or limbs
2. Available in gasoline or electric models
3. Available in a wide range of sizes
4. Larger sizes are capable of shredding larger materials

T. Generator



1. Used to supply electrical power in areas without electricity
2. Available in various sizes to produce different maximum wattages
3. Available in 110 VAC, 220 VAC, and 110 VAC or 220 VAC units

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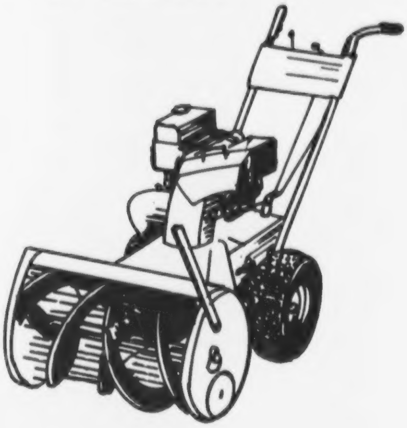
U. Snowblower



1. Used to remove snow from paved surfaces
2. Available in various sizes
3. Available in gasoline and electric models

INFORMATION SHEET

VI. **Safety practices for using string trimmers, edgers, portable blowers, and hedge shears**

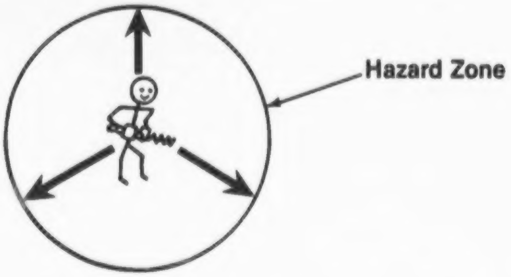
A. Carefully follow all general safety, electrical safety, and fuel safety practices listed in this information sheet's sections II, III, and IV.

B. Keep clear of discharge openings.

C. Do not point discharge openings toward people, animals, or buildings.

D. Keep people and animals out of hazard zone for thrown objects. (30 to 50 feet in every direction)

(NOTE: Always stop the engine if approached during operation.)



E. Do not swing or push tool with too much force.

(CAUTION: Loss of balance and injury can result.)

F. Do not over-reach the cutting zone.

G. Do not pick up the tool by grasping line limiters on trimmers or blades on edgers or shears.

H. Avoid touching motor parts which can become very hot during operation.

I. Do not raise shears above chest level or trimmer and blower heads above waist level while operating.

J. Use only flexible, non-metallic monofilament line of the correct diameter and length in string trimmers.

(CAUTION: Never substitute wire, rope, or string.)

K. Stop edger blades when crossing gravel or paved surfaces.

INFORMATION SHEET

VII. Chainsaw safety practices

A. USE SPECIAL **CAUTION** AND EXTRA **CARE**.

B. Carefully follow all general safety, electrical safety, and fuel safety practices listed in this information sheet's sections II, III, and IV.

C. Wear safety ear and eye protection at all times.

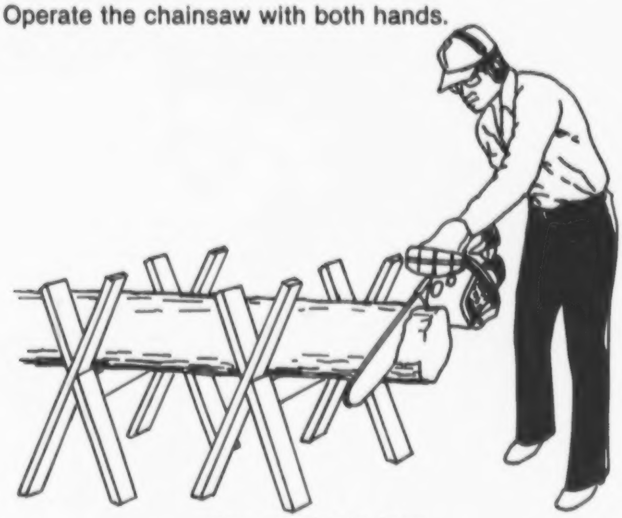
D. Clear work site of anything which will upset the operator's footing or can be damaged by falling material.

E. Plan a clear path of retreat from a falling tree or limbs before beginning to cut.

F. Keep body and clothing away from chainsaw moving parts.

G. Clear any loose, dead branches which might shake free and fall on the operator.

H. Operate the chainsaw with both hands.



Courtesy of John Deere

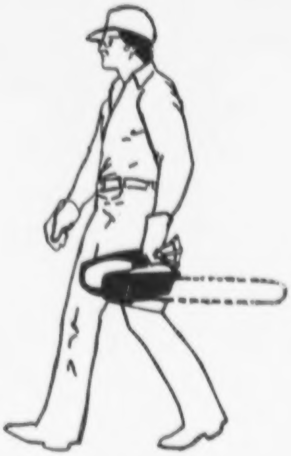
I. Do not cut above shoulder level.

J. Do not start a cut with the tip of the guide bar.

(CAUTION: Contact of the guide bar nose may cause the saw to suddenly move upward and backward [kickback] which can cause serious injury.)

INFORMATION SHEET

K. Carry the chainsaw with the engine stopped and the guide bar facing the rear.



Courtesy of John Deere

L. When transporting the saw, use guide bar scabbard (cover).

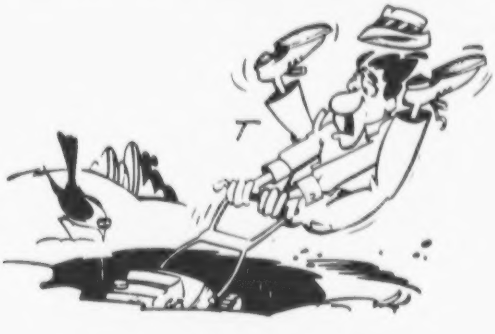
M. Keep saw sharp and properly maintained.

N. Keep hand grips clean and dry.

VIII. Mower safety practices

A. Carefully follow all general safety, electrical safety, and fuel safety practices listed in this information sheet's sections II, III, and IV.

B. Always fill in holes in turf area.



Courtesy of John Deere

INFORMATION SHEET

C. Disengage the self-propelled mechanism or drive clutch before starting.

D. Never bypass or tie-down the blade control safety handle.

(NOTE: The handle must operate freely in both directions.)

E. Never make wheel or cutting height adjustments with the motor running.

F. Never operate in wet grass or other instances which might result in poor footing or loss of balance.

G. Stop the blades before crossing gravel paths or roads.

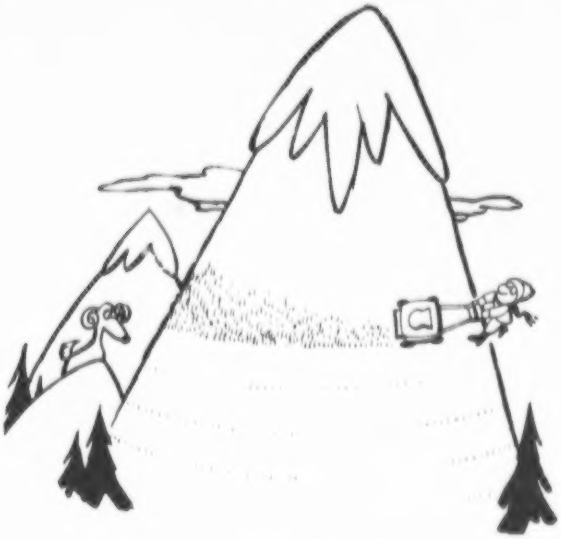
H. Avoid pulling mower backwards while mowing.

I. Never try to remove the grass catcher or chute with the engine running.

J. Never inspect the blades or place hands near the blades without disconnecting the spark plug wire.

(CAUTION: Prevent the wire from falling back against the plug.)

K. Mow across slopes, never up and down.



Courtesy of John Deere

INFORMATION SHEET

IX. **Rotary tiller safety practices**

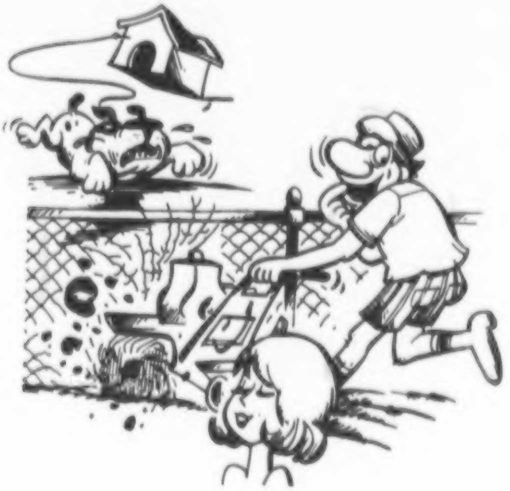
A. Carefully follow all general safety, electrical safety, and fuel safety practices listed in the information sheet's sections II, III, and IV.

B. Disengage tines before starting the engine.

C. Know how to stop the engine instantly.

D. Use EXTREME caution when backing the tiller. Always decrease speed when backing tiller.

E. Keep your eye and mind on the job.

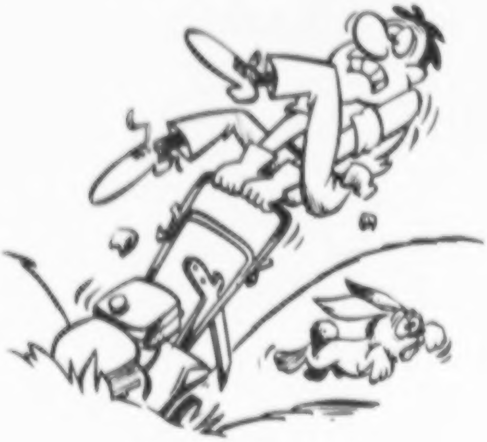


Courtesy of John Deere

F. Do not till too near underground electric cables, telephone lines, pipes, hoses, and hard paved surfaces.

INFORMATION SHEET

G. Till slopes, ditches, and soft soil cautiously.



Courtesy of John Deere

X. **Power shredder/mulcher safety practices**

A. USE SPECIAL CAUTION and EXTRA CARE.

B. Carefully follow all general safety, electrical safety, and fuel safety practices listed in the information sheet's sections II, III, and IV.

C. Always wear protective goggles or face shield.

D. Never push material into the refuse hopper with your hand. Use a strong stick or pole.

E. Wear tight fitting clothing and leather gloves.

(CAUTION: Gloves can become caught in equipment.)

F. Unplug the electric source or disconnect the spark plug wire prior to clearing a jam.

G. Never operate a shredder alone.

H. Know how to turn off the machine quickly.

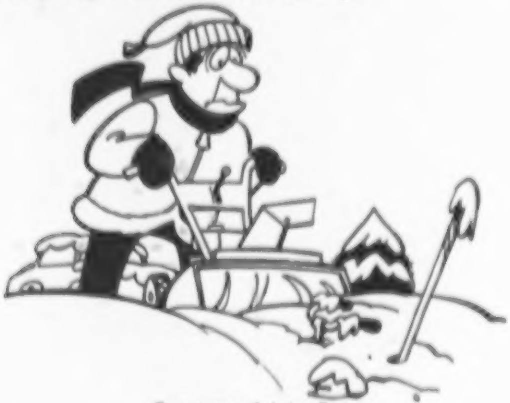
INFORMATION SHEET

XI. Snowblower safety practices

A. Carefully follow all general safety, electrical safety, and fuel safety practices listed in the information sheet's sections II, III, and IV.

B. Be sure area is clear of HIDDEN objects.

(NOTE: Units can blow snow up to 20 feet and propel hidden objects as far. Clear area **before** the first snowfall.)



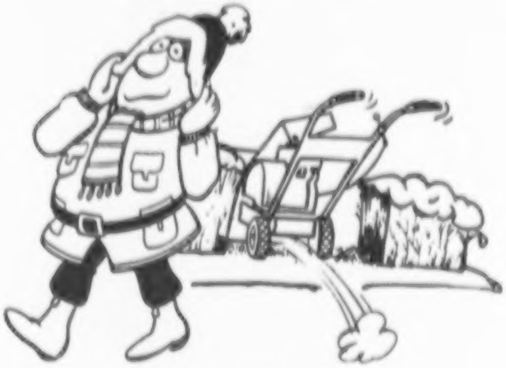
Courtesy of John Deere

C. Do not wear loose clothing especially a scarf which can get caught in the snow blower.

D. If clogged, stop engine and unplug or disconnect spark plug wire.

E. Watch for curbs, holes, or ditches that could cause a loss of balance.

F. Never leave the blower running unattended.

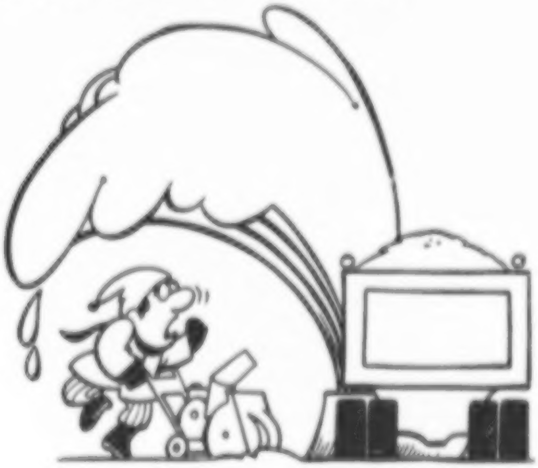


Courtesy of John Deere

G. Keep body parts away from rotor.

INFORMATION SHEET

H. Watch for traffic or people in the area.



Courtesy of John Deere

XII. Generator safety practices

A. Carefully follow all general safety, electrical safety, and fuel safety practices listed in information sheet's sections II, III, and IV.

B. Place machine on secure, level surface before operating.

C. Never operate generator near combustible materials in nonventilated area.

(WARNING: Exhaust contains poisonous carbon monoxide gas.)

D. Keep the immediate area free of bystanders.

E. Never touch the generator with a wet hand.

F. Do not use electrical equipment requiring more wattage than the unit can provide.

G. Switch power tools to the "OFF" position before plugging them into the generator.

INFORMATION SHEET

XIII. Procedures for winterizing and storing light power equipment

A. Clean all equipment parts to remove collected grease, soil, and vegetation.

B. Replace damaged parts and tighten loose screws, nuts, and bolts.

(NOTE: Order replacement parts now so equipment can be repaired before the next season.)

C. Sharpen all cutting edges.

D. Oil all bare metal surfaces.

E. Change engine oil if applicable.

F. Clean and oil air filter.

G. Drain gasoline from tank and run engine until all fuel is used from lines and carburetor.

H. Remove and clean the spark plug.

I. Add a few drops of oil into spark plug hole and turn the engine over to distribute.

J. Replace the spark plug.

K. Clean air passageways and fins on air-cooled engines.

L. Replace worn, damaged extension cords and electrical connectors.

M. Hang cords and tools on secure wall pegs or place on platform to keep equipment off damp floors.

LIGHT POWER EQUIPMENT
UNIT III

JOB SHEET #1 — USE A STRING TRIMMER

A. Tools and materials

1. String trimmer—gas or electric
2. Suitable area that requires trimming
3. Safety eye and ear protection
4. Protective clothing
5. Rakes
6. Broom

B. Procedure

1. Read safety and operation procedures outlined in the information sheet and the manufacturer's operating manual.
2. Obtain permission from your instructor to use the string trimmer.
3. Move the trimmer to the location selected by the instructor.
4. Check the trimmer before beginning operation.
    a. On gasoline models
        1) String trimmers have 2-cycle engines requiring a gas/oil mix.
        2) Fill fuel tank with appropriate mix.

        (CAUTION: Avoid gasoline spillage. Gasoline creates a fire hazard and kills plant materials.)
    b. On electric models
        1) Check the extension cord and electrical connectors on the unit.
        2) Repair or replace as necessary.
5. Clear the work site of stones, sticks, and other debris that may be thrown by the trimmer. Thrown objects can ricochet from fences, buildings, etc. into the operator.

JOB SHEET #1

6. Keep people and animals away from the work site or hazard zone. Trimmers can throw objects up to 30 feet.

7. Put on eye and ear protection.

8. Check the trimmer head for broken or loose parts that may be thrown during operation. Replace if necessary.

9. Start trimmer.

   (NOTE: Follow the starting procedure outlined in your operator's manual since general instructions may vary.)

   a. Electric models

      1) Plug cord in to a suitable outlet.

      2) Operate trigger switch.

   b. Gasoline models

      1) Engage the choke.

      2) Squeeze throttle trigger.

      3) Pull the starter rope until started.

      4) Repeat steps 1-3 as necessary.

      5) Push choke to off position.

      6) Operate throttle trigger until engine is running smoothly.

      (CAUTION: On gasoline models without clutches the trimmer head is always turning while the engine is running.)

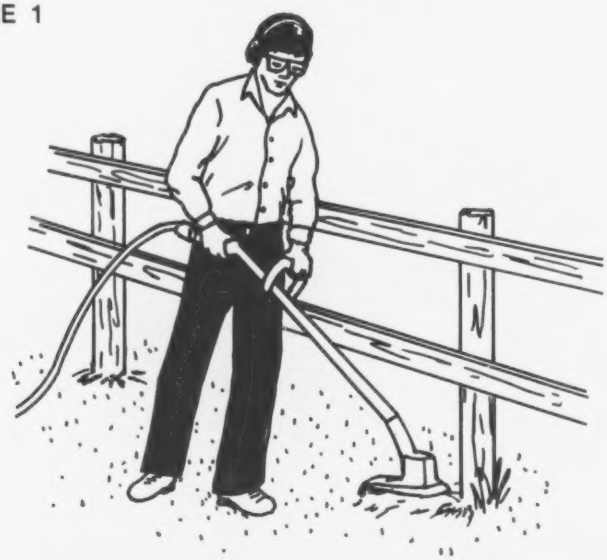
10. Keep the trimmer handle on the right side of your body, holding firmly with both hands.

11. Keep a firm footing; do not overreach.

JOB SHEET #1

12. Keep trimmer head below waist level, and body parts away from trimmer head.

FIGURE 1



13. Advance trimmer line as needed. Follow procedure in your operator's manual.

    (NOTE: Nylon line will wear faster and will need to be advanced frequently when cutting against rocks, bricks, concrete, metal fences, etc. Check with your instructor if you run out of line. The trimmer will need to be rethreaded with new line.)

    a. Operate the trimmer at full speed.

       (NOTE: Most electric models have only one speed. Gasoline models work best when operated only as fast as needed to do the job, and the line will wear less.)

    b. Hold the trimmer head parallel to and above a grass surface.

    c. Advance the line as it wears out as directed by the manufacturer.

       (NOTE: This may be accomplished by tapping the head lightly on the ground or by depressing the advance lever.)

JOB SHEET #1

14. Cut plant material using the following methods.

    a. Mow where conventional mowers cannot reach.

        1) Use full speed.

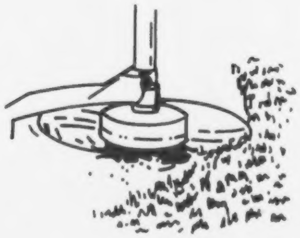
        (NOTE: Most electric models have only one speed. Gasoline models work best when operated only as fast as needed to do the job, and the line will wear less.)

        2) Hold head parallel to ground at desired cutting height.

        3) Move the head with an even sweeping action.

        4) Do not force the unit into the grass too quickly.

FIGURE 2



Mowing

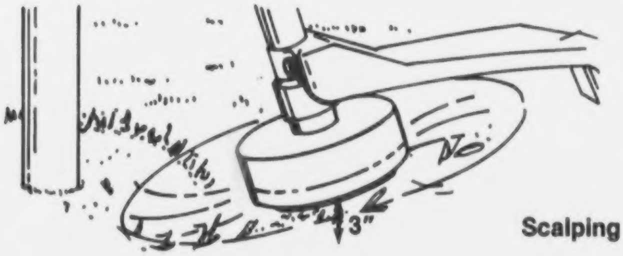
    b. Scalp to remove unwanted vegetation.

        1) Use moderate speed.

        2) Hold head at slight angle allowing the top of the line to strike the ground.

        3) Move the trimmer slowly to eliminate all grass and weeds in the area.

FIGURE 3



Scalping

JOB SHEET #1

c. Trim as needed.

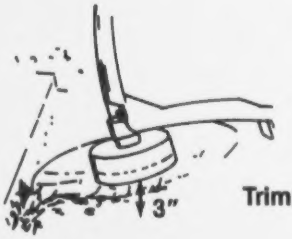
(CAUTION: Line will damage and kill trees or shrubs and scar fences.)

1) Use moderate speed.

2) Hold head at greater angle than for scalping, allowing tip of line to do the cutting.

3) Move trimmer slowly to remove plants.

FIGURE 4

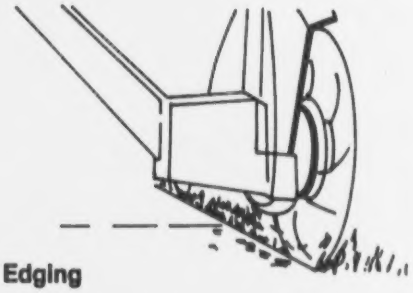


Trimming

d. Edge using models having adjustable motor housings which are designed for edging.

1) Turn trigger handle 180° positioning the motor housing upward to allow the trimmer head to cut vertically.

FIGURE 5



Edging

2) Hold the trimmer head to your side and walk parallel to the area to be edged.

JOB SHEET #1

15. Avoid letting the trimmer head continuously contact the ground.

16. Keep air vents on the motor housing free of debris.

17. Stop engine by releasing the throttle trigger and pushing the off button.
18. Unplug and neatly coil extension cords.
19. Cool and clean equipment.
20. Clean area and return materials to the correct storage areas.

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LIGHT POWER EQUIPMENT
UNIT III

JOB SHEET #2 — USE AN EDGER

A. Tools and materials

1. Edger—gas or electric
2. Suitable area for edging such as a sidewalk
3. Safety eye and ear protection
4. Protective clothing
5. Rakes
6. Brooms

B. Procedure

1. Read safety and operating procedures outlined in the information sheet and manufacturer's operating manual.
2. Obtain permission from your instructor to use edger.
3. Move the edger to the location selected by your instructor for edging.
4. Check edger before beginning operation.
    a. On gasoline edger
        1) Check oil level. Adjust if necessary with manufacturer recommended oil.
        2) Check fuel level. Fill if necessary. Use a funnel to avoid fuel spillage. Never fill a hot engine.

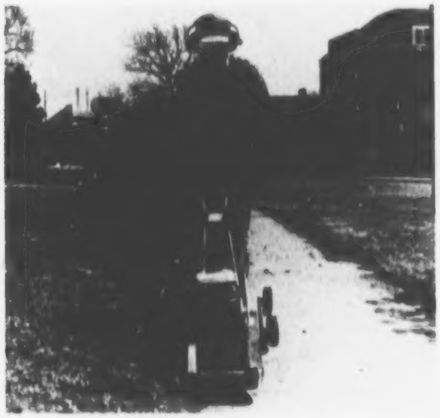
            (NOTE: Determine if the engine requires leaded or unleaded gasoline, or a gas/oil mix.)

            (CAUTION: Avoid gasoline spillage. Gasoline creates a fire hazard and kills plants.)
    b. On electric edger
        1) Check the extension cord and electrical connectors.
        2) Repair or replace as necessary.
    c. Check the depth adjustment of the cutter.

JOB SHEET #2

5. Clean the work site of rocks, sticks, and debris.
6. Be sure personnel are not in hazard zone.
7. Put on eye and ear protection.
8. To start the edger
    a. Gasoline edger
        1) Pull out the choke.
        2) Grasp the starter handles and pull out rapidly, returning slowly, until the motor starts.
        3) After starting, push the choke in slowly.
    b. Electric edger
        1) Connect extension cords with edger and electric source.
        2) Press starter switch.
9. Place wheels on the paved surfaces.
10. Engage blade and allow to spin freely before moving into turf.
11. Operate the edger so that the protective guard guide is positioned between the walk and the rotary blade.

FIGURE 1

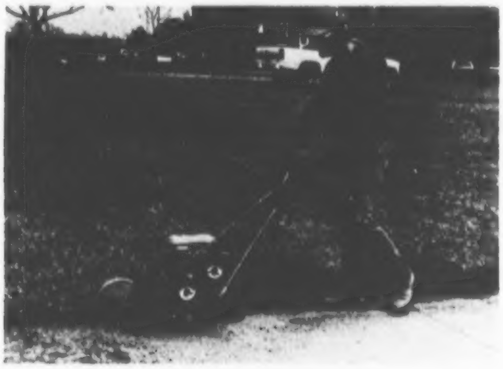


12. Do not allow the rotating blade to operate directly against the concrete walk or drive.

JOB SHEET #2

13. Keep a firm hold on the handle, and walk slowly moving the tool along edge of paved surface.

FIGURE 2



14. If the tool slows, back it an inch or two until the blade comes up to normal speed.
15. Stop motor when job is completed.
16. Turn switch to off position.
17. Unplug electric edger and neatly coil extension cords.
18. Disconnect spark plug wire of gasoline edger.
19. Allow edger to cool.
20. Clean all tools and equipment.
21. Clean area and return tools and materials to correct storage areas.

LIGHT POWER EQUIPMENT
UNIT III

JOB SHEET #3 — USE A WALK-BEHIND MOWER

A. Tools and materials

1. Reel or rotary walk-behind mower
2. Bagger for mower if so equipped
3. Suitable area to be mowed
4. Safety eye and ear protection
5. Protective clothing

B. Procedure

1. Read safety and operating procedures outlined in the information sheets and manufacturer's operating manual.
2. Obtain permission from your instructor to use the mower.
3. Move the mower to the location selected by your instructor.
4. Check the engine oil level. Adjust if necessary using the manufacturer's recommendations.
5. Check the fuel level. Fill if necessary.
    a. Use a funnel to avoid fuel spillage.
    b. Never fill a hot engine.

    (NOTE: Determine if the engine requires leaded or unleaded gasoline or a gas/oil mix.)

    (CAUTION: Avoid gasoline spillage. Gasoline creates a fire hazard and kills plants.)
6. Check cutting **height** and adjust as recommended by instructor.
7. Make sure your work site is clear, and personnel are not in the danger zone.
8. Familiarize yourself with the operating procedures of the mower you will be using.
9. Attach the bagger if so equipped.
10. Put on your eye and ear protection.

JOB SHEET #3

11. Start the engine.

    a. Pull out the choke, or move the throttle to the start position.

    b. Hold down the blade control lever if so equipped.

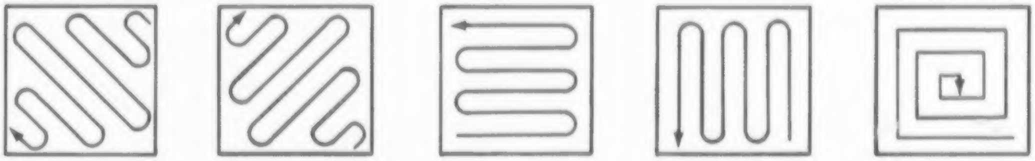
    c. Grasp the starter handle and pull rapidly, returning slowly, until the motor starts.

    d. After starting, push the choke in slowly or return the throttle to the run position.

12. Select an appropriate mowing pattern.

    (NOTE: Change the mowing patterns often when repeatedly mowing the same area to distribute turf wear and soil compaction from mower wheels.)

    FIGURE 1



13. Push mower over turf area at a slow to medium speed.

    a. Mow across slopes, not up and down.

    b. Avoid sharp turns that will tear turf.

    c. Avoid pulling the mower; always push the mower.

    d. Avoid mowing areas with loose gravel or other objects that may be thrown.

14. Overlap the previous mowed path as you work.

15. If the clipping bag becomes full,

    a. Stop the engine and wait until the blades stop.

    b. Disconnect the bag and empty in a designated location.

    c. Reattach the bag and begin at step 11.

16. Be careful not to bump into trees or fences which can cause serious injury and scaring.

17. When you have completed the mowing, stop the engine and allow the mower to cool.

18. Clean job site.

JOB SHEET #3

19. Return mower to service area.
20. Disconnect the spark plug wire and clean the mower especially removing clipping from the underside of the housing.
21. Clean area and equipment and return tools and materials to correct storage areas.

LIGHT POWER EQUIPMENT
UNIT III

JOB SHEET #4 — REMOVE AND REPLACE A ROTARY MOWER BLADE

A. Tools and materials

1. Rotary mower
2. Replacement blade of correct size for mower
3. Socket and ratchet of appropriate size
4. Wrench
5. Large screwdriver

B. Procedure

1. Read the manufacturer's recommended procedures for changing a blade.
2. Obtain permission from your instructor to change the mower blade.
3. DISCONNECT THE SPARK PLUG WIRE.

   (CAUTION: Be sure wire cannot fall back against plug.)
4. Turn the mower on its side with the carburetor side down to avoid engine flooding.
5. Place the socket (or wrench) on the bolt holding the cutter blade, and loosen and remove the bolt.

FIGURE 1

JOB SHEET #4

6. Remove the lock washer and any other washers present.

7. Remove the old blade.

FIGURE 2

8. Position the new or resharpened blade with cutting edges facing counter clockwise and curved edges up (toward housing.)

9. Install washers and bolts and tighten.

10. Torque bolt to manufacturer's specifications.

11. Turn mower upright.

12. Reconnect spark plug wire.

13. Make sure area is clean with adequate ventilation.

14. Start engine.

(NOTE: If unusual vibration occurs, stop engine, disconnect spark plug, and check blade. Readjust if necessary.)

15. If operation is normal, stop engine.

16. Clean and return tools and mower to the appropriate locations.

LIGHT POWER EQUIPMENT
UNIT III

JOB SHEET #5 — USE A VERTICAL MOWER/DETHATCHER

A. Tools and materials

1. Vertical mower/dethatcher
2. Suitable area requiring dethatching
3. Rotary or reel mower with bagger
4. Safety eye and ear protection
5. Protective clothing

B. Procedure

1. Read safety and operating procedures outlined in the information sheet and manufacturer's operating manual.
2. Obtain permission from your instructor to use vertical mower.
3. Move the vertical mower to the location selected by your instructor.
4. Check engine oil level. Adjust if necessary using the manufacturer's recommendation.
5. Check the fuel level. Fill if necessary.
    a. Use a funnel to avoid fuel spillage.

    (CAUTION: Never fill a hot engine.)

    b. Determine if the engine requires leaded or unleaded gasoline, or a gas/oil mix.
    c. Avoid gasoline spillage. Gasoline creates a fire hazard and kills plants.
6. Check the cutting depth.

    (NOTE: Experience under your own conditions is the best guide to proper depth setting. Check with your instructor.)

    a. Disconnect the spark plug and check the depth adjustment.
    b. Adjust if necessary following the manufacturer's procedures.
    c. Reconnect the spark plug.

JOB SHEET #5

7. Familiarize yourself with the operating procedures of the individual unit.
8. Make sure your worksite is clean, and personnel are not in dangerous areas.
9. Put on eye and ear protection.
10. Start engine.
    a. Pull out the choke.
    b. Grasp the starter handle and pull out rapidly, returning slowly until the motor starts.
    c. After starting, push the choke in slowly.
11. Increase the throttle to the appropriate engine speed.
12. Engage the cutting reel.

    (NOTE: Tip front of machine up when engaging cutting reel.)
13. Engage the drive wheels if applicable.
14. Operate the vertical mower over the designated area.
15. Disengage the drive wheels and cutting reels, and stop the engine.
16. Remove clippings from dethatched area with a leaf sweeper or a rotary or reel mower. (See Job Sheet #3)
17. Clean and return equipment and tools to the correct storage areas.

LIGHT POWER EQUIPMENT
UNIT III

JOB SHEET #6 — USE A REAR-TINE TILLER

A. Tools and materials

1. Rear-tine rotary tiller
2. Suitable area for tilling
3. Eye protection
4. Protective clothing

B. Procedure

1. Read safety and operating procedures outlined in the information sheet and manufacturer's operating manual.
2. Obtain permission from your instructor to use rotary tiller.
3. Move tiller to the location selected by your instructor.
4. Check engine oil level. Adjust if necessary using the manufacturer's recommendations.
5. Check fuel level. Fill if necessary.
   a. Use a funnel to avoid a fuel spillage.
   b. Never fill a hot engine.
   c. Determine if the engine requires leaded or unleaded gasoline.

      (NOTE: There are some very small tillers that require a gasoline/oil mix.)

   d. Avoid gasoline spillage. Gasoline creates a fire hazard and kills plants.
6. Familiarize yourself with the operating procedures of the individual unit so that you can start or stop it instantly.

   (NOTE: Individuals who have not operated a tiller should operate it in open areas.)

7. Make sure work site is clear of stones, sticks, and other foreign objects.

JOB SHEET #6

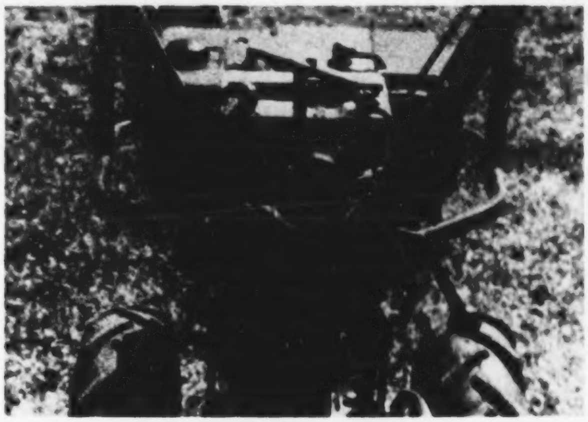
8. Place the tine control lever in neutral (PTO clutch lever).

FIGURE 1

DISENGAGE
ENGAGE

9. Place the wheel control lever in neutral.

FIGURE 2



JOB SHEET #6

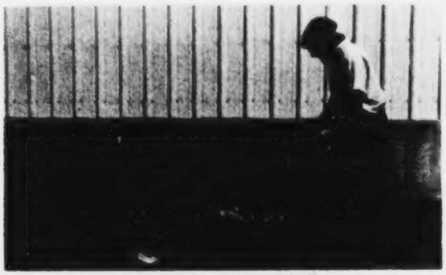
10. Adjust the tine depth control to the appropriate depth.

    (NOTE: It is better to make progressively deeper cuts with each pass of the tiller than to adjust too deeply and try to make one pass.)

    FIGURE 3

11. Pull the choke out.
12. Grasp the starter handle and pull out rapidly, returning slowly, until engine starts.
13. Slowly push the choke in.
14. Engage the tine control lever (PTO clutch lever).
15. Increase throttle to appropriate speed.
16. Place the speed selector in the slow position.
17. Place the wheel control lever in the forward position.
18. Guide the tiller using the handle bars.

    FIGURE 4



JOB SHEET #6

a. Let the tiller do the work. Fighting the tiller uses needless energy, and slows progress.

(NOTE: If the tiller begins to jump, raise the handlebars.)

b. Keep feet away from rotating tines.

c. When making the final tilling pass, footprints can be avoided by walking beside the tiller to guide it. This method should only be used after the soil has been cultivated, and is free from debris.

19. Turn the tiller as follows:

a. Slow the engine, and lift the tines from the soil using the handlebars.

b. Place the wheel control lever in neutral, then the tine control lever in neutral.

c. Engage the wheel control lever, and push the handlebars to swing the unit around.

d. Place the wheel control lever in neutral, then engage the tine control lever.

e. Engage the wheel control lever and proceed tilling.

(NOTE: In tight areas reverse can be used to turn around. **Use extreme care.** Always disengage tine before using reverse. Operators should only till in tight areas after they have had experience with the tiller.)

20. Stop the engine as follows:

a. Slow engine speed and lift tines from soil using handlebars.

b. Place wheel control lever in neutral.

c. Place tine control lever in neutral.

d. Turn off engine.

e. Adjust tine depth control to travel position (tines above ground.)

21. Allow the tiller to cool.

22. Clean the tiller of soil and plant debris.

23. Clean area and equipment and return tools and materials to correct storage areas.

LIGHT POWER EQUIPMENT
UNIT III

JOB SHEET #7 — USE A FRONT-TINE TILLER

A. Tools and materials

1. Front-tine rotary tiller
2. Suitable area for tilling
3. Eye protection
4. Protective clothing

B. Procedure

1. Read safety and operating procedures outlined in the information sheet and manufacturer's operating manual.
2. Obtain permission from your instructor to use rotary tiller.
3. Move tiller to the location selected by your instructor.
4. Check engine oil level. Adjust if necessary using the manufacturer's recommendations.
5. Check fuel level. Fill if necessary.
    a. Use a funnel to avoid a fuel spillage.
    b. Never fill a hot engine.
    c. Determine if the engine requires leaded or unleaded gasoline.

       (NOTE: There are some very small tillers that require a gasoline/oil mix.)

    d. Avoid gasoline spillage. Gasoline creates a fire hazard and kills plants.
6. Familiarize yourself with the operating procedures of the individual unit so that you can start or stop it instantly.

   (NOTE: Individuals who have not operated a tiller should operate it in open areas.)

7. Make sure work site is clear of stones, sticks, and other foreign objects.

JOB SHEET #7

8. Make sure the tine control lever is disengaged.

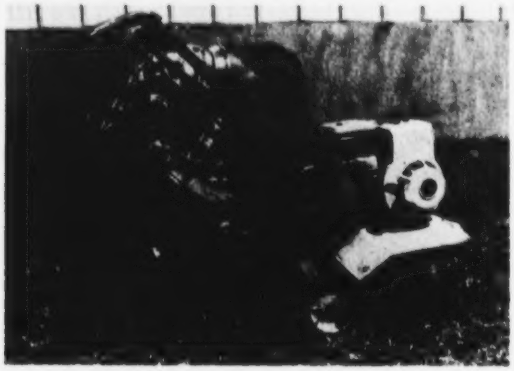
   (NOTE: On these types of tillers the tine control lever is on the handle, and grasping the lever to the handle engages the tines. The lever is spring loaded, and when released, the tines are disengaged. Make sure the lever works correctly prior to operation.)

   FIGURE 1

9. Adjust the depth control on the tiller.

   (NOTE: This is a vertical bar on the back of the tiller that is slotted. The lower it is set, the deeper the tiller digs.)

   FIGURE 2



10. Pull out the choke.

11. Grasp the starter handle and pull out rapidly, returning slowly, until the engine starts.

JOB SHEET #7

12. Push the choke in slowly.

13. Increase throttle to appropriate speed.

14. Engage tine control lever to begin tilling.

    FIGURE 3

    a. Let the tiller do the work rather than fighting the tiller and using needless energy.

    b. Control the tiller speed by gently lifting up or down on the handlebars. Lifting up slightly will move the tiller forward. Pushing down slightly will keep the tiller in the same position.

15. Turn the tiller as follows:

    a. Disengage the tines.

    b. Push the handlebars to cause the tiller to turn.

    c. Engage the tines.

16. Stop the engine.

    a. Disengage the tines.

    b. Slow the engine speed.

    c. Turn off the engine.

    d. Adjust the depth control bar to the travel position (all the way up).

JOB SHEET #7

17. Allow the tiller to cool.

18. Clean the tiller of soil and plant debris.

19. Clean area and equipment and return tools and materials to correct storage areas.

LIGHT POWER EQUIPMENT
UNIT III

PRACTICAL TEST
JOB SHEET #1 — USE A STRING TRIMMER

STUDENT'S NAME ______________________________ DATE ____________

EVALUATOR'S NAME ____________________________ ATTEMPT NO. ______

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper equipment and materials.	______	______
2. Checked operation of trimmer.	______	______
3. Cleared work site.	______	______
4. Started trimmer.	______	______
5. Held trimmer correctly.	______	______
6. Advanced trimmer line as needed.	______	______
7. Cut plant materials appropriately—mowed, scalped, trimmed, edged.	______	______
8. Stopped engine.	______	______
9. Cooled and cleaned equipment and work area.	______	______
10. Checked in/put away tools and materials.	______	______
11. Practiced safety rules throughout procedure.	______	______

EVALUATOR'S COMMENTS: ____

____

JOB SHEET #1 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:				
No damage to plants, fences, and related structures	4	3	2	1
Proper and uniform height	4	3	2	1
Thoroughness of trimming job	4	3	2	1

EVALUATOR'S COMMENTS: ____

____

PERFORMANCE EVALUATION KEY

4 — Skilled — Can perform job with no additional training.
3 — Moderately skilled — Has performed job during training program; limited additional training may be required.
2 — Limited skill — Has performed job during training program; additional training is required to develop skill.
1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

LIGHT POWER EQUIPMENT
UNIT III

PRACTICAL TEST
JOB SHEET #2 — USE AN EDGER

STUDENT'S NAME ______________________________ DATE ____________

EVALUATOR'S NAME ____________________________ ATTEMPT NO. ______

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper equipment and materials.	______	______
2. Checked operation of edger.	______	______
3. Cleared work site.	______	______
4. Started edger.	______	______
5. Operated edger correctly.	______	______
6. Stopped edger.	______	______
7. Unplugged electric edger or disconnected spark plug wires on gas edger.	______	______
8. Cleaned the work area, tools, and equipment.	______	______
9. Checked in/put away tools and materials.	______	______
10. Practiced safety rules throughout procedure.	______	______

EVALUATOR'S COMMENTS: ____

____

JOB SHEET #2 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:				
Uniform and proper width and depth of trench	4	3	2	1
No damage to edged material	4	3	2	1
Straight, clean lines	4	3	2	1
Thoroughness of edging job	4	3	2	1

EVALUATOR'S COMMENTS: ______________________________

____

PERFORMANCE EVALUATION KEY

4 — Skilled — Can perform job with no additional training.
3 — Moderately skilled — Has performed job during training program; limited additional training may be required.
2 — Limited skill — Has performed job during training program; additional training is required to develop skill.
1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

LIGHT POWER EQUIPMENT
UNIT III

PRACTICAL TEST
JOB SHEET #3 — USE A WALK-BEHIND MOWER

STUDENT'S NAME ______________________ DATE ____________

EVALUATOR'S NAME ______________________ ATTEMPT NO. ______

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper equipment and materials.	______	______
2. Checked oil and fuel levels and filled as necessary.	______	______
3. Checked operation of mower.	______	______
4. Started engine.	______	______
5. Operated mower.	______	______
6. Emptied bag as necessary.	______	______
7. Stopped engine.	______	______
8. Disconnected spark plug wire.	______	______
9. Cleaned the work area, tools, and equipment.	______	______
10. Checked in/put away tools and materials.	______	______
11. Practiced safety rules throughout procedure.	______	______

EVALUATOR'S COMMENTS: ____

____

JOB SHEET #3 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:

No damage to turf site	4	3	2	1
Evenly mowed turf	4	3	2	1
Proper cutting height	4	3	2	1
Good cutting pattern	4	3	2	1
Thoroughness of mowing job	4	3	2	1

EVALUATOR'S COMMENTS: ______________________________

____

PERFORMANCE EVALUATION KEY

4 — Skilled — Can perform job with no additional training.
3 — Moderately skilled — Has performed job during training program; limited additional training may be required.
2 — Limited skill — Has performed job during training program; additional training is required to develop skill.
1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

LIGHT POWER EQUIPMENT
UNIT III

PRACTICAL TEST
JOB SHEET #4 — REMOVE AND REPLACE A ROTARY MOWER BLADE

STUDENT'S NAME ______________________________ DATE ____________

EVALUATOR'S NAME ____________________________ ATTEMPT NO. ______

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper equipment and materials.	______	______
2. Disconnected spark plug wires.	______	______
3. Turned mower on its side, carburetor down.	______	______
4. Removed bolt, lock washer, and cutter blade.	______	______
5. Installed new blade.	______	______
6. Replaced lock washer and bolt.	______	______
7. Reconnected spark plug wire.	______	______
8. Started engine.	______	______
9. Stopped engine.	______	______
10. Cleaned the work area, tools, and equipment.	______	______
11. Checked in/put away tools and materials.	______	______
12. Practiced safety rules throughout procedure.	______	______

EVALUATOR'S COMMENTS: ____

____

JOB SHEET #4 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:

Blade installed properly	4	3	2	1
Bolt is tight	4	3	2	1

EVALUATOR'S COMMENTS: ______________________________

____

PERFORMANCE EVALUATION KEY

4 — Skilled — Can perform job with no additional training.
3 — Moderately skilled — Has performed job during training program; limited additional training may be required.
2 — Limited skill — Has performed job during training program; additional training is required to develop skill.
1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

LIGHT POWER EQUIPMENT
UNIT III

PRACTICAL TEST
JOB SHEET #5 — USE A VERTICAL MOWER/DETHATCHER

STUDENT'S NAME ______________________________ DATE ____________

EVALUATOR'S NAME ______________________________ ATTEMPT NO. ______

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper equipment and materials.	______	______
2. Checked oil and fuel level and filled as necessary.	______	______
3. Checked cutting depth.	______	______
4. Checked operation of mower.	______	______
5. Started engine.	______	______
6. Engaged cutting reel and drive wheels.	______	______
7. Passed verticutter over the area twice, at right angles.	______	______
8. Disengaged drive wheels and cutting reels and stopped engine.	______	______
9. Removed clippings.	______	______
10. Cleaned the work area, tools, and equipment.	______	______
11. Checked in/put away tools and materials.	______	______
12. Practiced safety rules throughout procedure.	______	______

EVALUATOR'S COMMENTS: ____

____

JOB SHEET #5 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:				
Dethatched to proper depth	4	3	2	1
All debris removed properly	4	3	2	1
Thoroughness of dethatching job	4	3	2	1

EVALUATOR'S COMMENTS: ____

____

PERFORMANCE EVALUATION KEY

4 — Skilled — Can perform job with no additional training.
3 — Moderately skilled — Has performed job during training program; limited additional training may be required.
2 — Limited skill — Has performed job during training program; additional training is required to develop skill.
1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

LIGHT POWER EQUIPMENT
UNIT III

PRACTICAL TEST
JOB SHEET #6 — USE A REAR-TINE TILLER

STUDENT'S NAME ______________________________ DATE ____________

EVALUATOR'S NAME ____________________________ ATTEMPT NO. ______

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper equipment and materials.	______	______
2. Checked oil and fuel level and filled as necessary.	______	______
3. Checked operating instructions for tiller.	______	______
4. Operated tiller as required including proper starting, moving, turning, and stopping.	______	______
5. Cleaned the work area, tools, and equipment.	______	______
6. Checked in/put away tools and materials.	______	______
7. Practiced safety rules throughout procedure.	______	______

EVALUATOR'S COMMENTS: ____

____

JOB SHEET #6 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:				
Consistent and proper depth	4	3	2	1
Smoothness of finished area	4	3	2	1
Uniform soil particle size	4	3	2	1
Thoroughness of tilling job	4	3	2	1

EVALUATOR'S COMMENTS: ______________________________

____

PERFORMANCE EVALUATION KEY

4 — Skilled — Can perform job with no additional training.
3 — Moderately skilled — Has performed job during training program; limited additional training may be required.
2 — Limited skill — Has performed job during training program; additional training is required to develop skill.
1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

LIGHT POWER EQUIPMENT
UNIT III

PRACTICAL TEST
JOB SHEET #7 — USE A FRONT-TINE TILLER

STUDENT'S NAME ______________________________ DATE ____________

EVALUATOR'S NAME ____________________________ ATTEMPT NO. ______

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper equipment and materials.	______	______
2. Checked oil and fuel level and filled as necessary.	______	______
3. Checked operating instructions for tiller.	______	______
4. Operated tiller as required including proper starting, moving, turning, and stopping.	______	______
5. Cleaned the work area, tools, and equipment.	______	______
6. Checked in/put away tools and materials.	______	______
7. Practiced safety rules throughout procedure.	______	______

EVALUATOR'S COMMENTS: ____

____

JOB SHEET #7 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:				
Consistent and proper depth	4	3	2	1
Smoothness of finished area	4	3	2	1
Uniform soil particle size	4	3	2	1
Thoroughness of tilling job	4	3	2	1

EVALUATOR'S COMMENTS: ____

____

PERFORMANCE EVALUATION KEY

4 — Skilled — Can perform job with no additional training.
3 — Moderately skilled — Has performed job during training program; limited additional training may be required.
2 — Limited skill — Has performed job during training program; additional training is required to develop skill.
1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

LIGHT POWER EQUIPMENT
UNIT III

TEST

NAME ____________________ SCORE ____________________

1. Match the terms on the right with the correct definitions.

_____a. Tool used to blow leaves and clippings from paved surfaces other than by sweeping or washing

_____b. Device which punches out or slices small pieces of sod to reduce compaction and admit air, water, and soil amendments

_____c. Tool used to shape hedges and small shrubs by cutting small twigs and limbs

_____d. Tendency for a chainsaw to jump back when the guide tip touches an object or when the wood closes in and pinches the chain in the cut

_____e. Device that cuts succulent twigs, weeds, and grass by a whirling nylon line

_____f. Machine used to pick up debris such as clippings, leaves, and papers

_____g. Machine used to remove growing turf from established areas

_____h. Machine which converts mechanical energy into electrical energy

_____i. An internal combustion engine in which every other piston stroke is a power stroke

_____j. Machine which shreds or chops plant waste material to smaller, compost-size pieces

_____k. Machine used in cultivating planting areas to a soil depth of 1" to 8"

1. Kickback
2. Aerator
3. Vacuum
4. Generator
5. Tiller
6. Shredder
7. Blower
8. Hedge shears
9. String trimmer
10. Sod cutter
11. Rotary edger
12. Two-cycle engine
13. Four-cycle engine

TEST

2. Complete the following statements concerning general safety practices for power equipment by circling the correct words.

   a. Operators should read, understand, and (**ignore, follow**) the warnings and instructions in the operator's manual before using any tool.

   b. Review operator manual at the beginning of each season and as equipment is replaced by similar but newer models (**no matter how experienced you are, only if you are inexperienced**).

   c. Know how to (**wash, stop**) and (**overhaul, start**) equipment before operating.

   d. Keep hands, feet, and clothing away from (**moving parts, stationary handles**).

   e. Always wear heavy, long pants, (**sandals, boots**), and gloves.

   f. Remove all sticks, wires, rocks, and foreign objects from the area (**before, after**) operating.

   g. Stop engine (**after, before**) cleaning, fueling, or making any adjustments.

   h. Never run an engine in a/an (**ventilated, unventilated**) area.

   i. Keep handles free of (**dry paint, oil**) and fuel.

   j. (**Always, Do not**) force a tool to operate at too fast a rate.

   k. (**Ignore, Heed**) all warning signs.

3. Complete the following statements concerning electric safety practices for power equipment by circling the correct words.

   a. (**Never, Always**) use grounded plugs and cords.

   b. Use only the (**gasoline, voltage**) supply recommended for a tool.

   c. Do not use near (**electrical outlet, flammable liquids**).

   d. Do not use in snow or (**dry, wet**) locations.

   e. Use undamaged extension cords and electrical connectors designed for (**outdoor, indoor**) use.

   f. Never carry an electric tool by the (**extension cord, handle**).

   g. Do not touch the (**handle, starter**) while connecting an extension cord.

   h. (**Unplug, Plug in**) a tool when it is not in use.

   i. Keep tool housing free of debris to prevent (**motor overheating, paint discoloration**).

   j. Always (**unplug, plug in**) an electric tool from the power source, even if the motor is off, before servicing, transporting, or storing.

TEST

4. Complete the following statements concerning fuel safety practices for light power equipment by circling the correct words.

   a. Mix and pour fuels **(anywhere, outdoors)**.

   b. Never mix or pour fuels while **(smoking, chewing gum)**.

   c. Use only **(plastic, approved)** fuel containers.

   d. **(Wipe up, Burn off)** all spills on machinery and drives.

   e. Move away from a spill area **(after, before)** starting the engine.

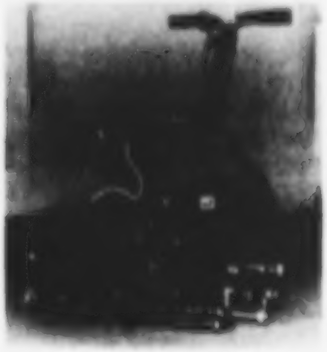
   f. Never remove the gas cap or add fuel when the engine is **(running or hot, off or cool)**.

   g. Always allow the engine to cool **(after, before)** transporting or storing a tool.

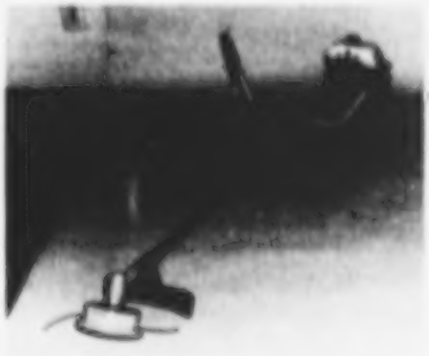
   h. **(Empty, Fill)** the fuel tank before storing a tool.

5. Identify light power equipment used in groundskeeping.

   (NOTE: Be sure to identify as electric or gasoline.)

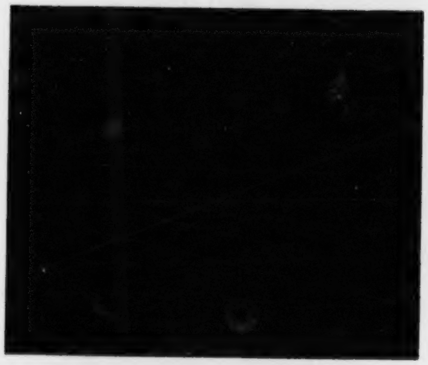


a. ______________________________



b. ______________________________

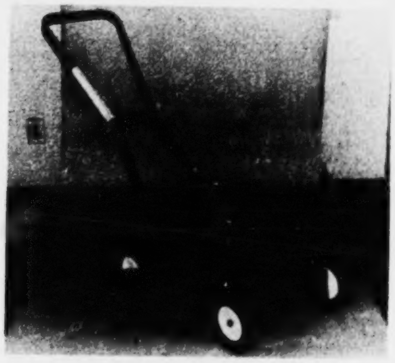
TEST



c. ____________________

d. ____________________

e. ____________________



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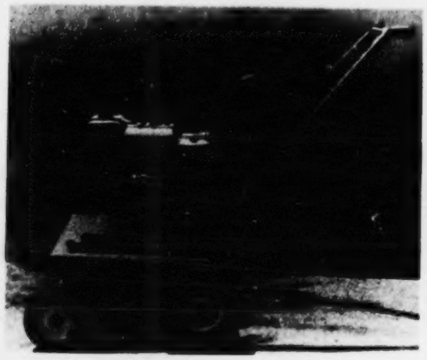
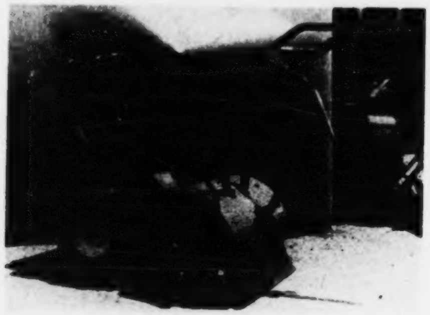
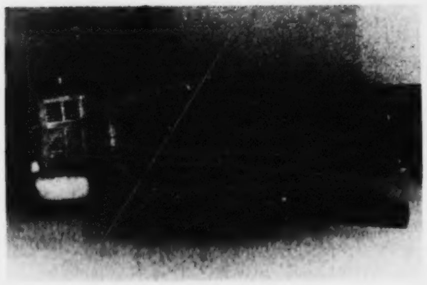


g. ____________________

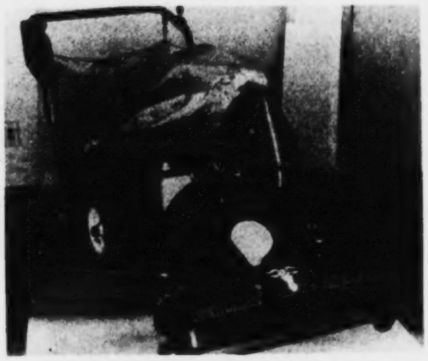


h. ____________________

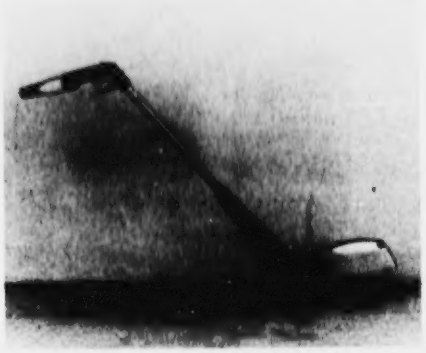
TEST



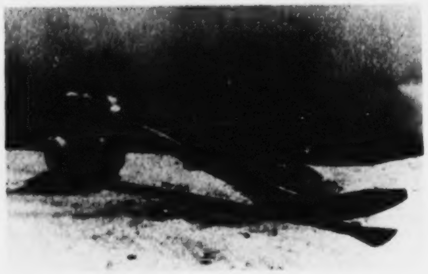
i. ________________



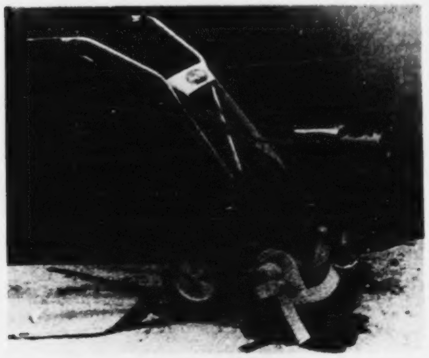
j. ________________



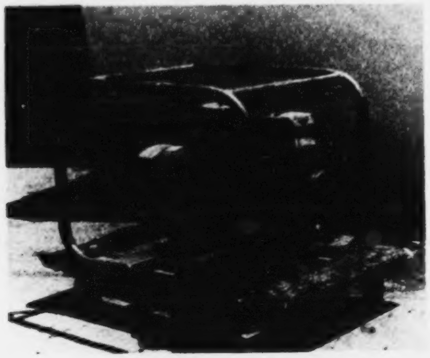
k. ________________



l. ________________

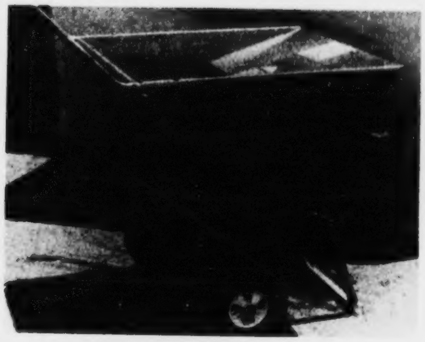


m. ________________

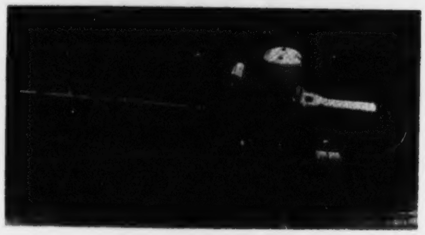


n. ________________

TEST



o. ______________________



p. ______________________

q. ______________________

r. ______________________

TEST

6. Complete the following statements concerning safety practices for string trimmers, edgers, portable blowers, and hedge shears by filling in the blanks correctly with the following words:

discharge, hazard zone, gravel, diameter, blades, waist, chest, hot, cold, swing, overreach

a. Keep clear of ____________ openings.

b. Keep people and animals out of ____________ ____________ for thrown objects.

c. Do not ____________ or push tool with too much force.

d. Do not ____________ the cutting zone.

e. Do not pick up the tool by grasping line limiters on trimmers or ____________ or edgers or shears.

f. Avoid touching motor parts which can become very ____________ during operation.

g. Do not raise shears above ____________ level or trimmer and blower heads above ____________ level while operating.

h. Use only flexible, non-metallic monofilament line of the correct ____________ and length in string trimmers.

i. Stop edger blades when crossing ____________ or paved surfaces.

7. Complete the following statements concerning chainsaw safety practices by filling in the blanks correctly with the following words:

dead, hand grips, retreat, ear, footing, stopped, tip, caution, shoulder, both, clothing, sharp, waist, scabbard

a. Use special ____________ and extra care.

b. Wear safety ____________ and eye protection.

c. Clear work site of anything which will upset the operator's ____________ or can be damaged by falling material.

d. Plan a clear path of ____________ from a falling tree or limb before beginning to cut.

e. Keep body and ____________ away from chainsaw moving parts.

f. Clear any loose, ____________ branches which might shake free, falling on the operator.

TEST

g. Operate the chainsaw with ____________ hands.

h. Do not cut above ____________ level.

i. Do not start a cut with the ____________ of the guidebar.

j. Carry the chainsaw with the engine ____________ .

k. When transporting the saw, use guide bar ____________ .

l. Keep saw ____________ and properly maintained.

m. Keep ____________ ____________ clean and dry.

8. Select true statements concerning mower safety practices by placing a "T" or "F" next to the true or false statements.

_____a. Fill in holes in turf area.

_____b. Disengage the self-propelled mechanism on drive clutch after starting.

_____c. Never bypass or tie down the blade control handle.

_____d. Make wheel or cutting height adjustments with the motor running.

_____e. Stop the blades before crossing gravel paths or roads.

_____f. Pull mower backwards while mowing.

_____g. Remove the grass catcher or chute with the motor running.

_____h. Never disconnect the spark plug wire.

_____i. Mow up and down a slope, never across it.

9. Select true statements concerning rotary tiller safety practices by placing a "T" or "F" next to the true or false statements.

_____a. Engage tines before starting the engine.

_____b. Know how to stop the engine instantly.

_____c. Never back up a tiller.

_____d. Keep your eye and mind on the job.

TEST

10. List four safety practices you must follow when using a power shredder/mulcher.

    a. ____

    b. ____

    c. ____

    d. ____

11. Complete the following statements concerning snowblower safety practices by filling in the blanks correctly with the following words:

    unplug, loose, unattended, hidden, curbs, traffic, rotor

    a. Be sure the area is clear of ____________ objects.

    b. Do not wear ____________ clothing, especially a scarf which can get caught in the blower.

    c. If clogged, stop engine and ____________ or disconnect spark plug wire.

    d. Watch for ____________, holes, or ditches that could cause a loss of balance.

    e. Never leave the blower running ____________.

    f. Keep body parts away from ____________.

    g. Watch for ____________ or people in the area.

12. Complete the following statements concerning generator safety practices by circling the correct words.

    a. Place generator on (**level, slopping**) surface before operating.

    b. Never operate generator in (**ventilated, nonventilated**) area.

    c. Never touch the generator with a (**dry, wet**) hand.

    d. Switch power tools to the (**OFF, ON**) position before plugging them into the generator.

13. Select true statements concerning procedures for winterizing and storing light power equipment by placing a "T" or "F" next to their appropriate statements.

    _____a. Do not clean equipment before storing.

    _____b. Replace all damaged parts.

    _____c. Cutting edges should not be sharpened before storing for winter. Do that next summer.

    _____d. Change engine oil if applicable.

    _____e. Refill fuel tank before storing.

TEST

(NOTE: If the following activities have not been accomplished prior to the test, ask your instructor when they should be completed.)

14. Demonstrate the ability to:

    a. Use a string trimmer. (Job Sheet #1)

    b. Use an edger. (Job Sheet #2)

    c. Use a walk-behind mower. (Job Sheet #3)

    d. Remove and replace a rotary mower blade. (Job Sheet #4)

    e. Use a vertical mower/dethatcher. (Job Sheet #5)

    f. Use a rear-tine tiller. (Job Sheet #6)

    g. Use a front-tine tiller. (Job Sheet #7)

LIGHT POWER EQUIPMENT
UNIT III

ANSWERS TO TEST

1. a. 7
   b. 2
   c. 8
   d. 1
   e. 9
   f. 3
   g. 10
   h. 4
   i. 12
   j. 6
   k. 5

2. a. Follow
   b. No matter how experienced you are
   c. Stop and start
   d. Moving parts
   e. Boots
   f. Before
   g. Before
   h. Unventilated
   i. Oil
   j. Do not
   k. Heed

3. a. Always
   b. Voltage
   c. Flammable liquids
   d. Wet
   e. Outdoor
   f. Extension cord
   g. Starter
   h. Unplug, from
   i. Motor overheating
   j. Unplug

4. a. Outdoors
   b. Smoking
   c. Approved
   d. Wipe up
   e. Before
   f. Running or hot
   g. Before
   h. Empty

5. a. Gasoline reel walk-behind mower
   b. Gasoline string trimmer
   c. Gasoline edger
   d. Electric string trimmer
   e. Gasoline chainsaw
   f. Gasoline rotary walk-behind mower
   g. Dethatcher
   h. Rear-tine rotary tiller
   i. Gasoline backpack blower
   j. Vacuum sweeper
   k. Electric edger
   l. Hand held blower

ANSWERS TO TEST

m. Front-tine rotary tiller
n. Generator
o. Shredder, mulcher/wood chipper
p. Electric hedge trimmers
q. Sod cutter
r. Electric chainsaw

6. a. Discharge
b. Hazard zone
c. Swing
d. Over-reach
e. Blades
f. Hot
g. Chest, waist
h. Diameter
i. Gravel

7. a. Caution
b. Ear
c. Footing
d. Retreat
e. Clothing
f. Dead
g. Both
h. Shoulder
i. Tip
j. Stopped
k. Scabbard
l. Sharp
m. Hand grips

8. a. T
b. F
c. T
d. F
e. T
f. F
g. F
h. F
i. F

9. a. F
b. T
c. F
d. T

10. Any four of the following:

a. Use special caution and extra care.
b. Carefully follow all general safety, electrical safety, and fuel safety practices.
c. Wear protective goggles or face shield.
d. Never push material into the refuse hopper with your hand. Use a strong stick or pole.
e. Wear tight fitting clothing and leather gloves.
f. Unplug the electric source or disconnect the spark plug wire prior to clearing a jam.
g. Never operate a shredder alone.
h. Know how to turn off the machine quickly.

ANSWERS TO TEST

11. a. Hidden
    b. Loose
    c. Unplug
    d. Curbs
    e. Unattended
    f. Rotor
    g. Traffic

12. a. Level
    b. Nonventilated
    c. Wet
    d. OFF

13. a. F
    b. T
    c. F
    d. T
    e. F

14. Performance skills evaluated to the satisfaction of the instructor.

WATER AND WATERING TECHNIQUES
UNIT IV

UNIT OBJECTIVE

After completion of this unit, the student should be able to relate environmental and cultural factors to irrigation systems required for water management. Competencies will be demonstrated by completing the assignment sheets, job sheet, and the unit tests with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to water and watering techniques with the correct definitions.
2. Select from a list reasons for supplemental irrigation.
3. List two ways watering affects plant performance.
4. Distinguish between conditions that increase or decrease water requirements.
5. List factors affecting water quality.
6. Select from a list water conservation methods.
7. List results of improper watering techniques.
8. List methods for correcting water problems.
9. Complete statements concerning the causes and results of waterlogged soils.
10. Distinguish between plant symptoms resulting from excess or deficient water.

OBJECTIVE SHEET

11. Match types of irrigation systems with the correct descriptions.

12. List advantages and disadvantages of using mulches.

13. Identify the main parts of hose tubing.

14. Rate the types of hose construction materials according to their durability.

15. State uses for different diameters of hose tubing.

16. Identify hose couplings and repair devices.

17. Select true statements concerning hose maintenance.

18. Identify types of hose-end watering devices.

19. Match types of hose-end watering devices with their correct characteristics.

20. Select true statements concerning general maintenance procedures for hose-end attachments.

21. Identify general types of sprinklers.

22. Match types of sprinklers with their correct characteristics.

23. Identify general plant symptoms resulting from excess or deficient water. (Assignment Sheet #1)

24. Sketch a sprinkler water pattern. (Assignment Sheet #2)

25. Measure the amount of water applied by a sprinkler. (Assignment Sheet #3)

26. Demonstrate the ability to repair a hose coupling. (Job Sheet #1)

WATER AND WATERING TECHNIQUES
UNIT IV

SUGGESTED ACTIVITIES

A. Obtain additional materials and/or invite resource people to class to supplement/reinforce information provided in this unit of instruction.

(NOTE: This activity should be completed prior to the teaching of this unit.)

B. Provide students with objective sheet.

C. Discuss unit and specific objectives.

D. Provide students with information and assignment sheets.

E. Discuss information and assignment sheets.

F. Provide students with job sheet.

G. Discuss and demonstrate the procedure outlined in the job sheet.

H. Integrate the following activities throughout the teaching of this unit:

1. Collect information from local extension bulletins.
2. Request multiple copies of equipment catalogs for students.
3. Invite an irrigation specialist to speak to your students.
4. Invite a representative of a local residential or commercial groundskeeping company to speak to your students.
5. Discuss the cost of water in the immediate area.
6. Have the students select an existing irrigation system and discuss the water cost in its operation.
7. Discuss water analysis procedures.
    a. Take a water analysis of a potential water source.
    b. Give the sample to the local extension agent who will send it to a testing facility.
    c. Review the examples of satisfactory and poor water analyses (Handouts #1-#2) with the students.
    d. Discuss the results of the water analysis taken in class.

SUGGESTED ACTIVITIES

8. Demonstrate a soil probe to show moisture conditions in contrasting areas.

   Example: Clay soil vs. sandy soil

9. Organize a class tour to maintained grounds where the different water practices and/or problems may be viewed and discussed.

   (NOTE: Assignment Sheet #1 may be used to evaluate existing plant materials.)

10. Discuss the advantages and disadvantages of the four basic irrigation systems.

11. Select a specific grounds area and discuss factors affecting the irrigation systems needed in its development and maintenance.

12. Provide as many samples of actual watering materials for students to inspect.

    Examples: Hoses, sprinklers, nozzles, breakers, mulches

13. Show healthy plants and their root systems.

14. Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas for improvement.

I. Give test.

J. Evaluate test.

K. Reteach if necessary.

RESOURCES USED IN DEVELOPING THIS UNIT

A. Beard, Dr. James B. *How to Have a Beautiful Lawn*. College Station, TX: Beard Books, 1983.

B. Daniel, Dr. W.H. and Dr. R.P. Freeborg. *Turf Managers' Handbook*. Cleveland, OH: Harvest Publishing Co., 1979.

C. Giles, Floyd. *Landscape Construction Procedures, Techniques, and Design*. Champaign, IL: Stipes Publishing Co., 1986.

D. *How to Select, Use, and Maintain Garden Equipment*. Chevron Chemical Co., San Francisco, CA 94105.

E. Ingels, Jack E. *Landscaping: Principles and Practices*. Albany, NY: Delmar Publishers Inc., 1987.

F. Ingels, Jack E. *Ornamental Horticulture: Principles and Practices*. Albany, NY: Delmar Publishers Inc., 1985.

REFERENCES USED IN DEVELOPING THIS UNIT

G. Janick, Jules. *Horticultural Science*, 4th ed. New York: W.H. Freeman and Company.

H. *Sprinkler Irrigation Handbook*. Glendora, CA: Rain Bird Sprinkler Mfg. Corp.

SUGGESTED SUPPLEMENTAL RESOURCES

A. *A Better Way to Water*

Submatic Irrigation Systems of Austin
3902 Woodbury Ave.
Austin, TX 78704

B. *Drip Irrigation, Conservation*

Texas Water Development Board
P.O. Box 13231
Capitol Station
Austin, TX 78711-3231

C. *Horticultural Tool and Supply Catalog*

A.M. Leonard, Inc.
6665 Spiker Road
Piqua, OH 45356

D. Leuthold, Larry D., *Watering Your Lawn*, 1977

Cooperative Extension Service
Kansas State University
Manhattan, KS

E. Schwab, Delbert and Dudley Barefoot, *Trickle Irrigation for Lawns, Gardens, and Small Orchards*

Cooperative Extension Service
Oklahoma State University
Stillwater, OK 74078-0481

WATER AND WATERING TECHNIQUES
UNIT IV

INFORMATION SHEET

I. **Terms and definitions**

A. Drainage tile — Clay or plastic tube beneath the soil surface that carries away excess water

B. Evaporation — Water loss as a vapor

C. Growing season — Period between beginning growth in the spring and cessation of growth in the fall

(NOTE: The duration will vary for different plants in the same locality because of the relative hardiness of plants to low and/or high temperatures.)

D. Irrigation — Application of supplemental water

E. Mulch — Material applied to the soil surface around plants to reduce water loss, decrease soil temperature fluctuation, and discourage weed growth

Examples: Straw, pine bark, sawdust, gravel, woven mats, plastic

F. Necrosis — Death of tissue

G. pH — Measure of acidity or alkalinity on a scale whose values run from 0 to 14 with 7 representing neutrality, less than 7 acidity, and greater than 7 alkalinity

H. PSI — Pounds per square inch; a unit for measuring pressure

I. Relative humidity — The amount of water vapor that air can hold compared to water-saturated air at the same temperature

J. Runoff — Surface flow of water from an area

K. Slope — Incline of the surface of a soil

L. Soil permeability — Quality of soil that enables water or air to move through it

M. Soil texture — Refers to the proportions of particle sizes in the soil

Examples: Sand, largest particle size; silt, medium particle size; clay, smallest particle size

N. Soluble salts — Dissolved minerals in water which affect water quality

O. Swale — A shallow depression in a turf area

INFORMATION SHEET

P. Water — H_2O; up to 85% of a plant's fresh weight

Q. Waterlogged — Soil condition in which large and small pore spaces are filled with water

II. Reasons for supplemental irrigation

A. Uneven rainfall distribution

B. Unseasonably high temperatures

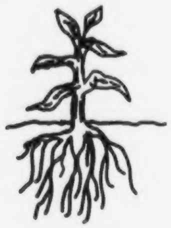
C. Higher individual plant water requirements

(NOTE: Some plants desired in the landscape require more water than naturally falls as rain in that environment. Therefore, irrigation must be used in caring for that plant.)

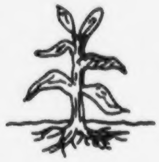
III. Ways watering affects plant performance

A. Promotes deep rooting

Example: Frequent shallow watering causes shallow rooting.



Deep watering promotes deep rooting



Shallow watering promotes shallow rooting

B. Maintains plant health and growth

Examples: Cold damage on evergreens can be avoided by proper watering during fall and winter. Inadequate water can kill a plant or severely stunt its growth.

IV. Factors affecting water requirements

A. ***Plant species*** — Some species require more water.

B. ***Stage of plant establishment*** — Water is more critical for young and newly transplanted plants.

Examples: Grass seed requires frequent watering for germination and establishment. Newly planted trees should be watered immediately after planting.

INFORMATION SHEET

C. ***Soil texture*** — Coarse-textured (sandy) soils require more frequent watering than fine-textured (clay) soils.

D. ***Temperature*** — Warmer temperatures increase water use.

(NOTE: Some water loss due to evaporation may be avoided by watering when temperature is lower.)

E. ***Wind*** — Greater wind velocities increase water demand.

(NOTE: Some water loss due to evaporation may be avoided by watering when wind velocity is low.)

F. ***Relative humidity*** — Lower relative humidities increase water loss.

G. ***Mulch*** — Mulches can be used to reduce water loss. When no mulch is used, soils lose more water to evaporation and require more water.

H. ***Plant competition*** — Greater plant densities increase water use.

I. ***Growing season*** — Demand is higher when plants are growing than when they are dormant.

J. ***Site***

1. Southern slopes receive more wind and sun.
2. Areas with large tree roots compete for water.
3. Areas along street curbs, patios, walls, and driveways receive heat from the pavement.
4. Different areas of the landscape may require varied watering schedules.

V. **Factors affecting water quality**

A. Presence of suspended particles (silt)

Examples: Sand, soil, algae

B. Presence of chemicals

Examples: Chlorine, water softeners, industrial waste

C. High soluble salts or high sodium concentrations

(NOTE: Salts make it difficult for plants to extract the moisture from soil.)

INFORMATION SHEET

D. High or low pH

(NOTE: Irrigation water quality is obtained from water quality analyses. These analyses can be done through your county extension office. See samples in Handouts #1 and #2.)

VI. Water conservation methods

A. Remove weeds and undesirable plants to reduce competition.

B. Avoid aerial applications in high winds.

C. Water in early morning.

D. Water the depth and frequency needed to maintain plant health.

E. Use trickle (drip) irrigation systems where possible.

F. Mulch around trees and in flower beds.

G. Use drought-tolerant plants.

H. Cultivate compacted soil areas to reduce runoff.

I. Remove dense thatch in lawn to reduce runoff.

J. Use shut-off valve on hose end.

K. Clear patios and sidewalks by sweeping with a broom or with a portable blower rather than by washing with a garden hose.

VII. Improper watering techniques and their results

A. Too much excess water

1. Leaches fertilizer
2. Reduces plant growth
3. Increases erosion
4. Compacts soil
5. Increases irrigation costs
6. Increases plant diseases
7. Decreases rooting depth
8. Decreases soil aeration

INFORMATION SHEET

- B. Not enough water
  - 1. Reduces plant growth
  - 2. Promotes soil cracking
  - 3. Contributes to wind erosion of soil
  - 4. May completely kill plants causing increased cost for plant replacement

VIII. Methods for correcting water problems

- A. Use water conservation methods.
- B. Select appropriate irrigation system.
- C. Use appropriate mulches.
- D. Install drainage systems.
- E. Select proper plants.

IX. Waterlogged soils

- A. Caused by:
  - 1. Fine-textured, compacted soils
  - 2. Lack of surface and internal drainage
  - 3. Water accumulations in depressions
  - 4. Excessive irrigation or rainfall
- B. Results in:
  - 1. Poor soil aeration
  - 2. Reduced number of roots and plant vigor
  - 3. Increased disease occurrence
  - 4. Increased soil compaction

INFORMATION SHEET

X. **Plant symptoms resulting from excess or deficient water application** (Assignment Sheet #1)

A. Excess water

1. Dark, spongy roots
2. Light colored (chlorotic) new growth
3. Reduced shoot growth
4. Leaf fall
5. Sudden wilting during warm temperatures
6. Plant poorly anchored in soil

B. Deficient water

1. Few healthy, bright colored roots
2. Discolored foliage (greenish gray, purple tinge, light green)
3. Marginal leaf necrosis
4. Reduced shoot growth
5. Leaf fall
6. Wilting
7. Reduced bloom size
8. Reduced number of blooms
9. Fruit and bud drop

XI. **Types of irrigation systems**

A. Surface — Water conveyed directly over area

Examples: Flood irrigation, hose with water breaker

1. Advantages
    a. Small power requirement
    b. Less water evaporation
    c. Aids in establishing root-soil contact in new plantings
2. Disadvantages
    a. Uneven water distribution
    b. Compacts soil
    c. High manual labor requirement for constant monitoring and moving equipment
    d. May require special land preparation (such as drains)

INFORMATION SHEET

B. Subsurface — Water released underground to move upward to plant roots

   1. Advantages

      a. Minimal evaporative losses from soil

      b. Promotes deep rooting

      c. May be used as drain system during excessive rainfall

   2. Disadvantages

      a. Land must be level or evenly sloped.

      b. Water movement is uneven.

      c. Visual inspection of distribution system is very limited.

      d. Excessive rainfall can upset application balance.

      (NOTE: Subsurface irrigation requires permeable soil with a lower impervious layer to block downward water movement.)

C. Aerial (sprinkler) — Water released into the air under pressure

   1. Advantages

      a. Both small and large systems available

      b. Portable and permanent systems available

      c. Adaptable to uneven terrain

      d. Various delivery rates available

      (NOTE: Slower rates reduce compaction, erosion, and runoff.)

   2. Disadvantages

      a. High evaporative losses

      b. High cost of equipment

      c. High power requirement

      d. Uneven water distribution under windy conditions

INFORMATION SHEET

D. Trickle (drip) — Frequent, slow water application directly to the soil near individual plants through small pipes, tubes, and/or emitters

1. Advantages

    a. Conserves water

    (NOTE: There is less evaporation and the water is directed to individual plants, not soil between.)

    b. Small power requirement

    c. Aids weed control

    (NOTE: By watering the plants, not the area between, surrounding weeds do not receive water.)

    d. Can be automated

    e. Can be adapted to variable terrain and plant materials

    Examples: Steep slopes, narrow planted areas in high traffic areas, container plantings

    f. Allows combining of different plant material needs on same system

    Example: Large trees and individual flowers in beds

2. Disadvantages

    a. High maintenance costs

    b. Requires clean water source or filtering system

    c. Distribution pipes may be attacked by pests such as rabbits, deer, and ants.

XII. Advantages and disadvantages of using mulches

A. Advantages

1. Conserve moisture (lessen evaporation and runoff)

2. Reduce temperature fluctuations

3. Suppress weed growth

INFORMATION SHEET

B. Disadvantages

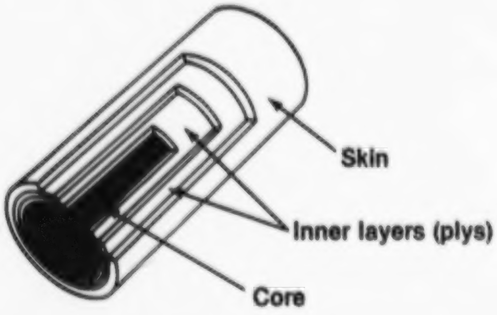
1. May attract rodents and other pests
2. Require periodic replacement due to deterioration and washing away
3. May retain excess water during prolonged rainy periods

XIII. Main parts of rubber hose tubing

A. Outer skin

B. Inner layers or plys

C. Core (center)



XIV. Types of hose construction materials and their durability ratings

A. Rubber — best

B. Nylon — better

C. Vinyl — good

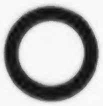
D. Plastic — poor

(NOTE: Combinations of these materials will have variable ratings.)

XV. Hose tubing diameters and general uses

(NOTE: The smaller hoses [3/8" - 1/2"] are primarily for homeowner use. Larger hoses are used commercially.)

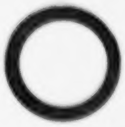
A. 3/8"



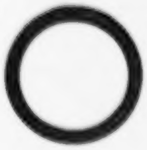
— Watering container plants

INFORMATION SHEET

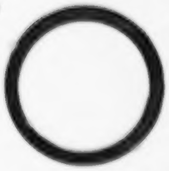
B. 1/2" — Watering container plants



C. 5/8" — Watering lawns and gardens



D. 3/4" — Watering large yards, greenhouses, and nurseries



E. 1" — Watering large yards, greenhouses, and nurseries

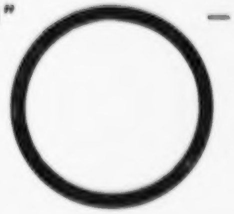


Table 1 — Diameters and Delivery Rates

1/2" at 50 psi delivers 1 1/3 gal/10 sec.

5/8" at 50 psi delivers 2 2/3 gal/10 sec.

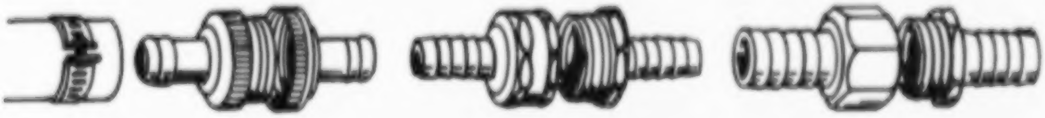
3/4" at 50 psi delivers 3 1/2 gal/10 sec.

(NOTE: The smaller the diameter, the less water delivered. Length of hose also affects delivery rates.)

INFORMATION SHEET

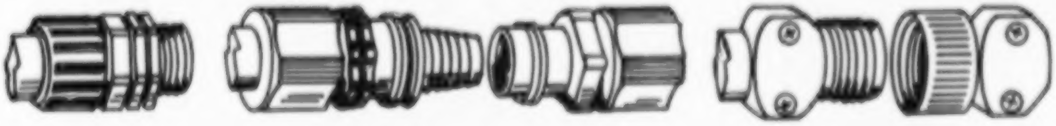
XVI. Hose couplings and repair devices (Job Sheet #1)

A. Couplings



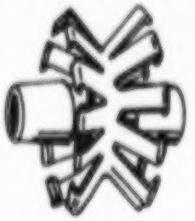
(NOTE: These are used with a hose clamp.)

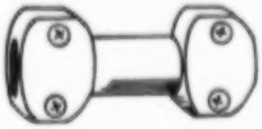
B. Hose end repair devices

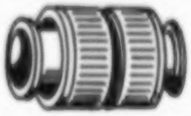


(NOTE: Coupling repair kits are suitable for rubber and vinyl hoses.)

C. In-line repair devices







(NOTE: Hose couplings and repair devices are constructed from a wide variety of materials.)

Examples:		
	Solid brass	Most Durable
	Round brass	↓
	Galvanized steel	
	Plastic	Least Durable

XVII. Correct hose maintenance

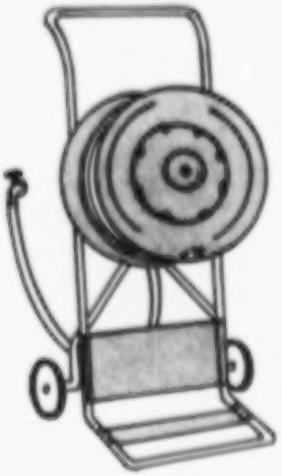
A. Never let hose kink.

B. Always release water pressure before storing.

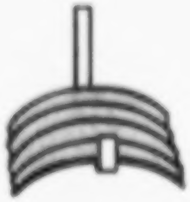
(NOTE: Remove from faucet connector.)

INFORMATION SHEET

C. Always hang hose on a wide support such as a hose hanger or reel.



Hose Reel



Hose Hanger

D. Shield hose from sunlight whenever possible.

E. DO NOT step on or drive over couplings or hoses.

F. Always completely drain water from hoses after use.

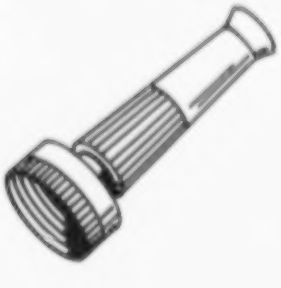
(NOTE: Hose will be lighter to carry. Any water freezing in the hose can cause severe damage such as cracking and splitting.)

G. Always clean couplings and fittings before joining.

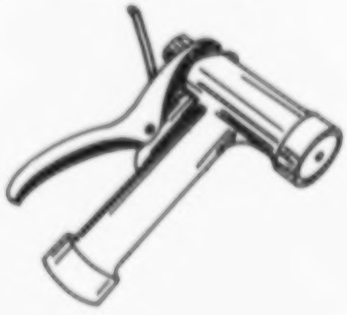
H. Connect the ends of a hose together when moving to keep dirt out of the hose.

XVIII. **Types of hose-end watering devices**

A. Twist-control nozzle

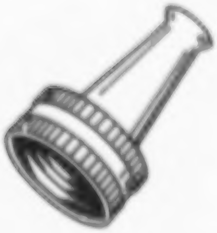


B. Pistol grip nozzle

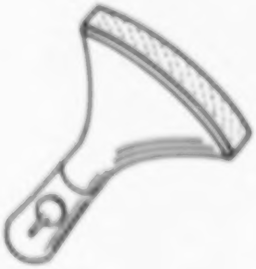


INFORMATION SHEET

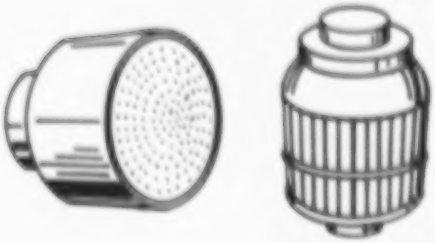
C. Sweeper or cleaning nozzle



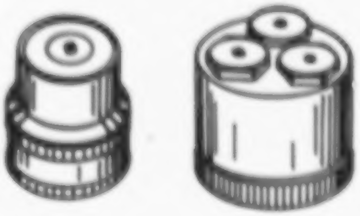
D. Fan-spray head



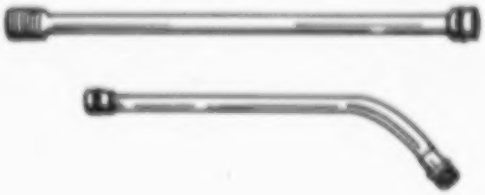
E. Water breakers or bubblers



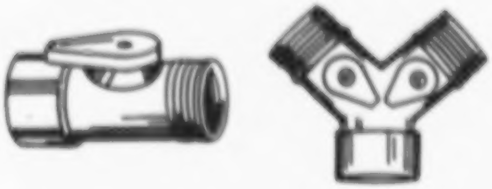
F. Mist heads



G. Wands (extensions)

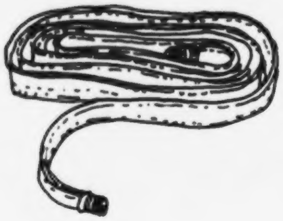


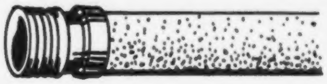
H. Shut-off valves



INFORMATION SHEET

I. Soaker hose





XIX. **Characteristics of hose-end watering devices**

A. Twist-control nozzle

1. Adjustable from fine mist to hard stream
2. Made of brass or plastic
3. Insulated nozzles are available.

B. Pistol grip nozzle

1. Hand pressure on trigger controls water volume and spray pattern.
2. Made of brass-plated zinc or plastic
3. Has a trigger lock
4. Accepts additional attachments

C. Sweeper or cleaning nozzle

1. Directs larger volumes of water in powerful streams
2. Made of brass or plastic
3. Not adjustable

D. Fan-spray head

1. Has wide spray with gentle delivery
2. Made of plastic or brass head set in plastic
3. Has optional swivel-mounted spike

INFORMATION SHEET

E. Water breaker or bubbler

1. Delivers high volume of water without erosion
2. Made of metal or plastic

F. Misting head

1. Produces a fine, fog-like spray
2. Adjustable from fine to coarse spray
3. Made of brass with removable jets

G. Wand (extension)

1. Made of aluminum with vinyl or rubber hand grip
2. Has threaded tip
3. Shut-off valves are available.

H. Shut-off valve

1. Made of plastic, zinc, or brass
2. Accepts attachments

I. Soaker hose

1. Seeps, trickles, or sprinkles
2. Made of canvas, plastic, or recycled rubber

XX. General maintenance procedures for hose-end attachments

A. Unclog jets and nozzle holes.

B. Shield plastic attachments from sun when not in use.

C. Rinse often to remove soil and debris from entire attachment.

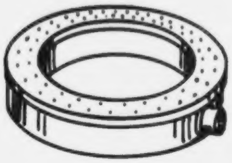
D. Straighten or replace misshapen, cracked, or faulty attachments.

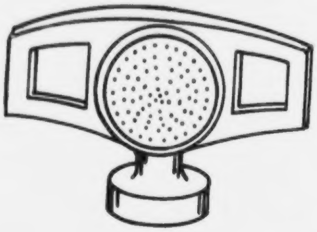
E. Lubricate moving parts often.

INFORMATION SHEET

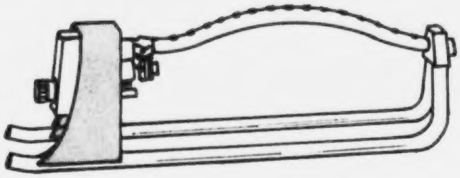
XXI. **General types of sprinklers** (Assignment Sheets #2 and #3)

A. Fixed spray

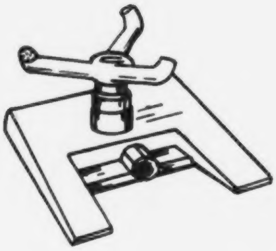




B. Oscillating

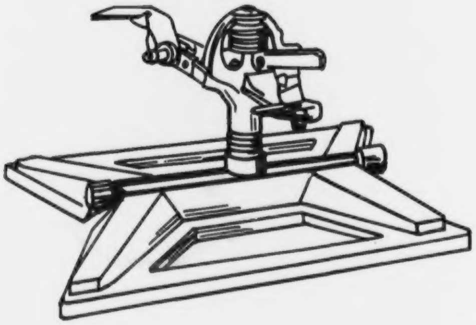


C. Revolving (rotary)

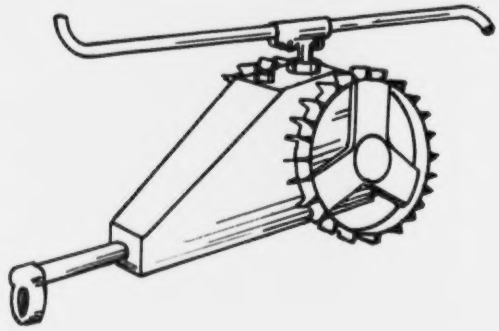


INFORMATION SHEET

D. Impulse



E. Traveling



XXII. Characteristics of sprinklers

A. Fixed spray sprinkler

1. Has no moving parts.
2. Is commonly used in hard to reach areas.
3. Standard heads have various patterns of holes.

   Examples: Round, square, rectangle

4. Adjustable heads contain several spray patterns.

INFORMATION SHEET

B. Oscillating sprinkler

1. Contains a row of nozzles in the single tube arm.
2. Produces a long, rectangular pattern.
3. Arm is adjustable from full to stationary movement.

C. Revolving (rotary) sprinkler

1. Has two or more spinning arms.
2. Head is mounted on wheels or skids.
3. Changeable nozzle tips and arms are available.
4. Produces a circular pattern from 5′ to 50′ in diameter or a locked narrow strip.

D. Impulse sprinkler

1. Rotates as water strikes counter balance and spring activated arm.
2. Adjustable from spray to stream.
3. Produces full or partial circle pattern up to 100′ in diameter.
4. Has exchangeable nozzle sizes.

E. Traveling sprinkler

1. Toy tractor type drags hose as it moves.
2. Hose reel type rolls up hose as it moves.
3. Requires hose pattern.
4. Powered by water pressure.
5. Affected by hose weight and length.
6. Accepts various sprinkler heads.

   Examples: Revolving, impulse

WATER AND WATERING TECHNIQUES
UNIT IV

HANDOUT #1 — SATISFACTORY WATER ANALYSIS REPORT

Water and Soil Salinity	State Lab No. 00000
Testing Laboratory	Invoice No. 00000
Agronomy Department	Date Tested 080687

COOPERATIVE EXTENSION SERVICE

WATER AND SOIL SALINITY TEST REPORT

Analysis: IRRIGATION Location: ________

Name MAVCC Landscaping Address ________ County ________

Electrical Conductivity umhos cm	pH	Total Soluble Salts (ppm)	Sodium Absorption Rate (SAR)	Exchangeable Sodium Percentage (%)	Sodium Percentage (%)	Texture	Residual Carbonates (meg)	Hardness (ppm)
700	7.1	462	2	.	60		0	.

PARTS PER MILLION							
Sodium	Calcium	Magnesium	Nitrate N	Chloride	Sulfate	Bicarbonate	Carbonate
Na	Ca	Mg	N	Cl	SO_4	HCO_3	CO_3
34	10	6	0	2	90	0	0

RECOMMENDATIONS:

This water can be used SATISFACTORILY for most crops if care is taken to prevent accumulation of soluble salts including sodium, in the soil. Good soil management and irrigation practices should be followed. Class 3 water can be used with little danger on permeable, well-drained soils in which water can readily move through the soil.

The water table should be at least 10 feet below the surface. This allows for leaching of accumulating salts by making an occasional application of irrigation water sufficient to leach the soil if this becomes necessary because of lack of rainfall. More care is required on heavy textured soils because water does not move through the soil profile as readily as on light textured or granular, permeable soils and leaching therefore is more difficult. If this water is used extensively, it is recommended that a soil sample be obtained every few years from the irrigated fields to determine the extent to which sodium or salts may be accumulating and the need for special management practices.

Cost $0.00

WATER AND WATERING TECHNIQUES
UNIT IV

HANDOUT #2 — UNSATISFACTORY WATER ANALYSIS REPORT

Water and Soil Salinity
Testing Laboratory
Agronomy Department

State Lab No. 00000
Invoice No. 00000
Date Tested 080687

COOPERATIVE EXTENSION SERVICE

WATER AND SOIL SALINITY TEST REPORT

Analysis: *IRRIGATION* Location: ________

Name *MAVCC Landscaping* Address ________ County ________

Electrical Conductivity umhos cm	pH	Total Soluble Salts (ppm)	Sodium Absorption Rate (SAR)	Exchangeable Sodium Percentage (%)	Sodium Percentage (%)	Texture	Residual Carbonates (meg)	Hardness (ppm)
4710	8.1	3109	14	.	80		5	.

PARTS PER MILLION							
Sodium	Calcium	Magnesium	Nitrate N	Chloride	Sulfate	Bicarbonate	Carbonate
Na	Ca	Mg	N	Cl	SO_4	HCO_3	CO_3
566	91	21	1	120	1420	704	0

RECOMMENDATIONS:

Water listed in this class is generally *UNSATISFACTORY* for irrigation use. It may be used for irrigation only under very special conditions and on the advice of a technician trained in irrigation water use. Use of this water should be confined to occasional use as a supplemental source of water on well-drained soils. It is not recommended for use on medium and heavy textured soils.

If this water is used extensively, it is recommended that a soil sample be obtained every few years from the irrigated fields to determine the extent to which sodium or salts may be accumulating and the need for special management practices.

Residual carbonates are present in excess amounts lowering water quality to unsuitable. Waters with too high residual carbonates may contain effective sodium in excess of that indicated by the sodium percentage of the water. The calcium and magnesium may precipitate out a lime, thus increasing the percentage of sodium.

Cost $0.00

WATER AND WATERING TECHNIQUES
UNIT IV

ASSIGNMENT SHEET #1 — IDENTIFY GENERAL PLANT SYMPTOMS RESULTING FROM EXCESS AND DEFICIENT WATER

NAME ____________________________ SCORE ____________________________

Directions: General plant symptoms resulting from excess and deficient water application were discussed in Information Sheet, Section X. You and your instructor may also be able to name other symptoms for particular plant materials. Your instructor will show you distressed and normal plant materials. List the type of plant and check the plant symptoms present on the form on the next page.

ASSIGNMENT SHEET #1

			Plant Symptoms													
Plant	New planting	Established planting	Dark, spongy roots	Poorly anchored in soil	Sudden wilting	Light colored new growth	Discolored foliage	Leaf margin necrosis	Reduced shoot growth	Reduced bloom size	Reduced bloom amount	Leaf fall	Others:			Symptoms indicate E=Excess watering D=Deficient watering
Example: Ornamental pear tree		X		X	X	X										E
1.																
2.																
3.																
4.																
5.																
6.																
7.																
8.																
9.																
10.																

WATER AND WATERING TECHNIQUES
UNIT IV

ASSIGNMENT SHEET #2 — SKETCH A SPRINKLER WATER PATTERN

NAME ______________________ SCORE ______________________

Directions: Examples of general types of sprinklers were discussed in Information Sheet, Section XXI. Your instructor will demonstrate a sprinkler of each type listed below.

1. Oscillating sprinkler set on full
2. Impulse sprinkler set at 1/4 circle
3. Traveling rotary sprinkler set to move 20′ along a straight line

(NOTE: Instructor may wish to demonstrate sprinklers under strong winds or steep slopes as well as under more favorable conditions.)

The student should sketch the resulting water pattern for each sprinkler demonstrated.

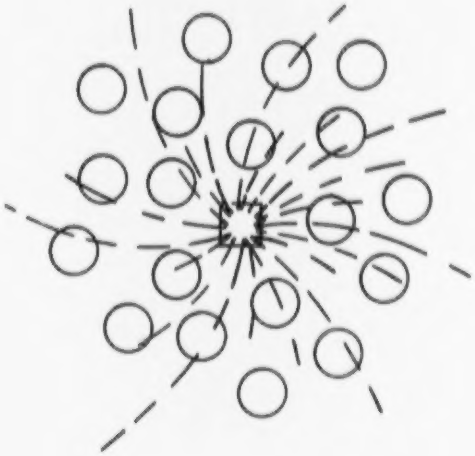
WATER AND WATERING TECHNIQUES
UNIT IV

ASSIGNMENT SHEET #3 — MEASURE THE AMOUNT OF WATER APPLIED BY A SPRINKLER

NAME ____________________ SCORE ____________________

Directions: Examples of general types of sprinklers were discussed in Information Sheet, Section XXI. Your instructor will select a sprinkler and connect it to a water source. Measure the water applied from this sprinkler by following the steps below.

1. Set up sprinkler on a level area if possible.
2. Select uniform containers with wide openings and straight sides.
3. Place uniform containers no more than five feet apart throughout the sprinkler water pattern.



4. Turn on water.
5. Operate sprinkler under normal conditions for one hour.

   (NOTE: Avoid conducting this assignment during periods of extreme high temperatures or winds.)

6. Measure the depth of water in each container in inches.
7. **Add** the depths together and **divide** by the number of containers. The resulting number will be an average amount of water applied by the sprinkler after one hour.

ASSIGNMENT SHEET #3

Answer the following questions:

1. What was the average amount of water applied by your sprinkler in one hour? ____________

2. How long should the sprinkler operate to apply 1" of water? ____________

3. Was the water applied uniformly throughout the sprinkler pattern? (Did each container have the same depth of water? ____________

4. Would the amount of water applied in one hour be different if the sprinkler was set up with a different water pressure (psi)? ____________

5. Why would the amount of water applied in one hour be different if the system was set up with the same sprinkler and water source but operated at 8:00 a.m. instead of 2:00 p.m.? ____

   ____

WATER AND WATERING TECHNIQUES
UNIT IV

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheets #1 and #2 — Evaluated to the satisfaction of the instructor

Assignment Sheet #3

1.-2. Answers will vary from area to area. Instructor should determine correct answer for locale.
3. No
4. Yes
5. Demand is usually less at 8:00 a.m. so water pressure is better and more water will be applied. Also outside temperature is lower at 8:00 a.m., and the wind is usually less, so less water is lost to evaporation and wind distortion of the pattern.

WATER AND WATERING TECHNIQUES
UNIT IV

JOB SHEET #1 — REPAIR A HOSE COUPLING

A. Tools and materials

1. Knife
2. Hose — rubber, vinyl
3. Coupling — male, female, brass, plastic
4. Hammer
5. Screwdriver

B. Procedure: Brass coupling on a rubber hose

(NOTE: This procedure may also be used to repair in-line damage using the appropriate device.)

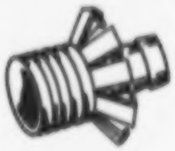
1. Select the correct size of coupling to match the size of hose being repaired.

   Example: 5/8" coupling for 5/8" hose

2. Select the correct coupling type for the hose being repaired.

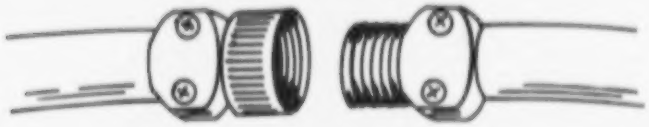
   a. Brass clincher coupling for a rubber hose

   FIGURE 1



   b. Plastic mender coupling for vinyl or rubber hose

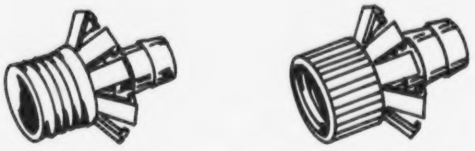
   FIGURE 2



JOB SHEET #1

c. Male or female coupling

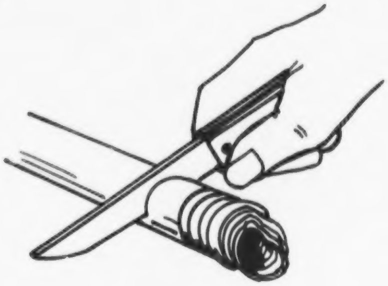
FIGURE 3



(NOTE: Types of couplings and fastening methods vary. Most manufacturers provide installation instructions with their types of menders.)

3. Cut off damaged coupling.

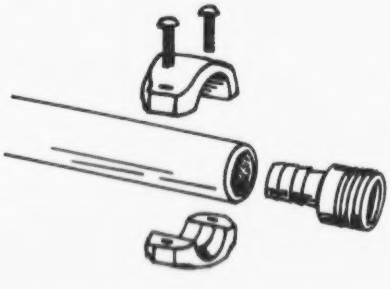
FIGURE 4



(NOTE: Be sure the end cut is smooth and even.)

4. Insert the tapered portion of coupling into the hose.

FIGURE 5



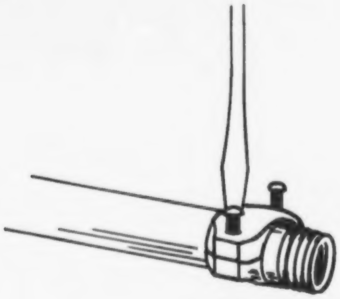
(NOTE: For easier installation, the hose end may be softened with hot water or the inside may be lubricated with soap or light oil.)

JOB SHEET #1

5. Tighten clamps or tongs of clincher around hose.

    a. Tighten clamps using a screwdriver for a plastic mender coupling.

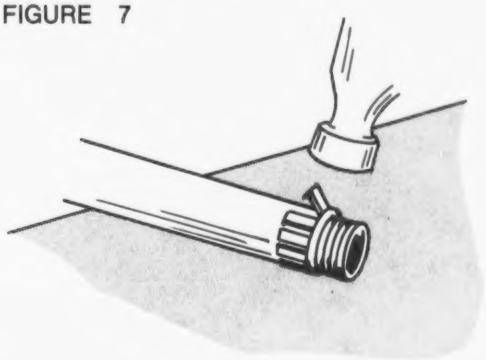
    FIGURE 6

    b. Imbed the tongs of the brass clincher into the rubber hose using a hammer.

    (NOTE: Support the clincher and hose by placing them on a paved floor or other solid surface.)

    FIGURE 7

6. Test coupling for a secure fit by connecting the hose to a water source.
7. Repeat the procedure if necessary.
8. Return the tools to their proper places.
9. Clean the work area.

WATER AND WATERING TECHNIQUES
UNIT IV

PRACTICAL TEST
JOB SHEET #1 — REPAIR A HOSE COUPLING

STUDENT'S NAME ______________________________ DATE ____________

EVALUATOR'S NAME ____________________________ ATTEMPT NO. ______

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper equipment and materials.	______	______
2. Selected correct size coupling for hose.	______	______
3. Selected correct coupling type for hose.	______	______
4. Cut off damaged end smoothly and evenly.	______	______
5. Insert the tapered portion of coupling into hose.	______	______
6. Tightened clamps or tongs using appropriate tool.	______	______
7. Tested repaired hose for leaks and secure fit.	______	______
8. Cleaned work area, tools, and equipment.	______	______
9. Checked in/put away equipment and materials.	______	______
10. Performed steps in a timely manner (___hrs. ___min. ___sec.)	______	______
11. Practiced safety rules throughout procedure.	______	______
12. Provided satisfactory responses to questions asked.	______	______

EVALUATOR'S COMMENTS: ____

____

JOB SHEET #1 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:				
Coupling is correct size and type	4	3	2	1
Insert is secure	4	3	2	1
Hose does not leak	4	3	2	1

EVALUATOR'S COMMENTS: ______________________________

____

PERFORMANCE EVALUATION KEY

4 — Skilled — Can perform job with no additional training.
3 — Moderately skilled — Has performed job during training program; limited additional training may be required.
2 — Limited skill — Has performed job during training program; additional training is required to develop skill.
1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

WATER AND WATERING TECHNIQUES
UNIT IV

TEST

NAME ______________________ SCORE ______________________

1. Match the terms on the right with the correct definitions.

_____a. Incline of the surface of a soil

_____b. Soil condition in which large and small pore spaces are filled with water

_____c. Clay or plastic tube beneath the soil surface that carries away excess water

_____d. Dissolved minerals in water which affect water quality

_____e. Material applied to the soil surface around plants to reduce water loss, soil temperature fluctuation, and discourage weed growth

_____f. Water loss as a vapor

_____g. Refers to the proportion of particle sizes in the soil

_____h. Death of tissue

_____i. Measure of acidity or alkalinity on a scale of 0 to 14

_____j. Pounds per square inch; a unit for measuring pressure

_____k. Surface flow of water from an area

_____l. Application of supplemental water

1. Drainage tile
2. Evaporation
3. Growing season
4. Irrigation
5. Mulch
6. Necrosis
7. pH
8. PSI
9. Relative humidity
10. Runoff
11. Slope
12. Soil permeability
13. Soil texture
14. Soluble salts
15. Swale
16. Water
17. Waterlogged

TEST

2. Select from the following list the reasons for supplemental irrigation by placing an "X" next to the correct reasons.

_____a. Too much rainfall

_____b. Unseasonably high temperatures

_____c. Higher individual plant water requirements—some plants just require more

_____d. Unseasonably low temperatures

_____e. Uneven rainfall distribution

3. List two ways watering affects plant performance.

a. ____

b. ____

4. Distinguish between conditions that increase or decrease water requirements by placing an "X" by the conditions that **increase** water requirements.

_____a. Newly planted lawn

_____b. Coarse-textured (sandy) soils

_____c. Fine-textured (clay) soils

_____d. High temperatures

_____e. Cool temperatures

_____f. High relative humidity

_____g. No mulch used

_____h. Plants are dormant

_____i. Areas along street curbs, patios, walls, and driveways

_____j. Low relative humidity

5. List two factors affecting water quality.

a. ____

b. ____

TEST

6. Select from the following list the water conservation methods by placing an "X" next to the correct methods.

_____a. Water as deep and frequent as required by plant materials.

_____b. Clear patios and sidewalks using water from a garden hose.

_____c. Water in early morning.

_____d. Remove weeds and undesirable plants to reduce competition.

_____e. Water in the middle of the day.

_____f. Mulch around trees and in flower beds.

_____g. Use trickle (drip) irrigation systems where possible.

_____h. Use aerial applications in high winds.

7. List results of improper watering techniques.

a. Too much water

1) ______________________________

2) ______________________________

3) ______________________________

4) ______________________________

b. Not enough water

1) ______________________________

2) ______________________________

8. List two methods for correcting water problems.

a. ______________________________

b. ______________________________

9. Complete statements concerning the causes and results of waterlogged soils.

a. Waterlogged soils may be caused by ____________ or ____________ .

b. Waterlogged soils may result in ____________ .

TEST

10. Distinguish between plant symptoms resulting from excess or deficient water by placing an "E" next to the symptoms of excess water and a "D" next to the symptoms of deficient water. Some symptoms indicate *either* excess or deficient water. Mark a D and an E next to those symptoms.

______a. Few healthy, bright colored roots

______b. Leaf fall

______c. Marginal leaf necrosis

______d. Dark, spongy roots

______e. Reduced shoot growth

______f. Wilting

______g. Light colored (chlorotic) new growth

______h. Discolored foliage such as greenish gray, purple tinge, light green

11. Match the types of irrigation systems on the right with the correct descriptions.

______a. Frequent, slow water application directly to the soil near individual plants through small pipes, tubes, and/or emitters

______b. Water released into the air under pressure

______c. Water conveyed directly over area

______d. Water released underground to move upward to plant roots

______e. An advantage of this system is that it aids in establishing good root-soil contact in new plantings. A disadvantage is it has a high manual labor requirement for constant monitoring and moving equipment.

______f. Advantages of this system are that it promotes deep rooting and has minimal evaporative losses from the soil. Disadvantages include that visual inspection of the system is very limited and the land must be level or evenly sloped for proper use.

______g. This system aids weed control, conserves water, and can be automated with a small power requirement. However, it requires a clean water source and can have high maintenance costs.

1. Aerial
2. Subsurface
3. Surface
4. Trickle

TEST

_____h. There are large and small, and portable and permanent systems available for this type of irrigation and it is adaptable to uneven terrain. But, it has several disadvantages—high evaporative losses, high equipment costs, high power requirement, and uneven water distribution under windy conditions.

12. List two advantages and two disadvantages of using mulches.

    a. Advantages

        1) ____________________

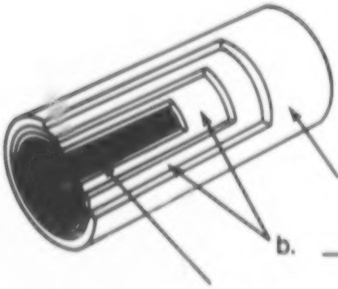
        2) ____________________

    b. Disadvantages

        1) ____________________

        2) ____________________

13. Identify the main parts of rubber hose tubing.



a. ____________________

b. ____________________

c. ____________________

14. Rate the following hose construction materials according to their durability as best, better, good, and poor.

__________a. Nylon

__________b. Plastic

__________c. Rubber

__________d. Vinyl

TEST

15. State uses for different diameters of hose tubing.

a. 3/4" - 1" diameters are best used for ______________________________

____

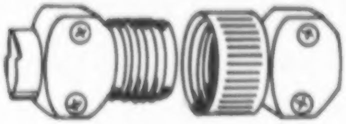
b. 3/8" - 1/2" diameters are best used for ______________________________

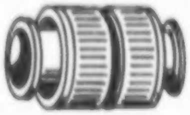
____

c. 5/8" diameter is best used for ______________________________

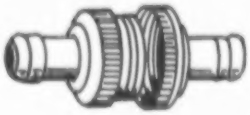
____

16. Identify hose couplings and repair devices.





a. ______________________________ b. ______________________________



c. ______________________________

17. Select true statements concerning hose maintenance by placing an "X" next to the correct statements.

_____a. Store hoses with water in them so they will remain flexible.

_____b. Hang hoses on wide supports such as reels or hose hangers.

_____c. Release water pressure before storing.

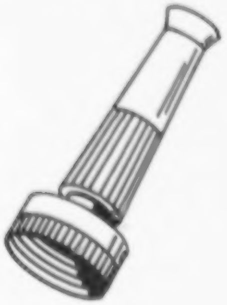
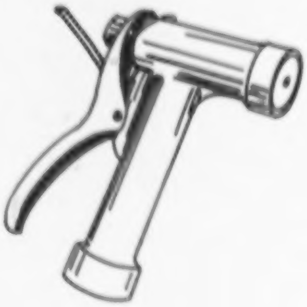
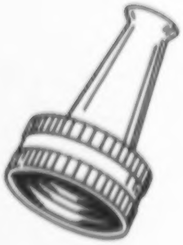
_____d. Never let hose kink.

_____e. Do not step or drive over coupling and hoses.

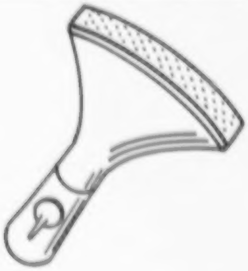
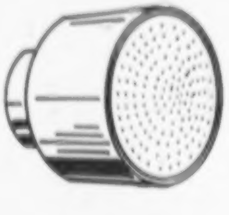
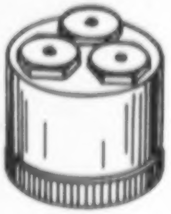
_____f. Store hose in sunlight to prevent mold.

TEST

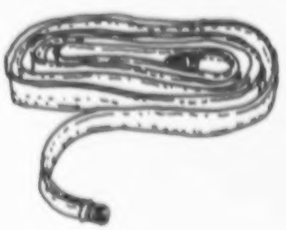
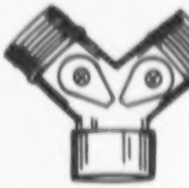
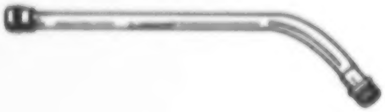
18. Identify types of hose-end watering devices.

a. ______________________
b. ______________________
c. ______________________

d. ______________________
e. ______________________
f. ______________________

g. ______________________
h. ______________________
i. ______________________

TEST

19. Match types of hose-end watering devices with their correct characteristics.

______a. Directs larger volumes of water in powerful streams

______b. Has wide spray with gentle delivery

______c. Produces a fine, fog-like spray

______d. Hand pressure on trigger controls water volume and spray pattern

______e. Adjustable from fine mist to hard stream

______f. Delivers high volume of water without erosion

______g. Seeps, trickles, or sprinkles

1. Twist-control nozzle
2. Pistol grip nozzle
3. Sweeper or cleaning nozzle
4. Fan-spray head
5. Water breaker or bubbler
6. Misting head
7. Wand
8. Soaker hose

20. Select true statements concerning general maintenance procedures for hose-end attachments by placing an "X" next to the true statements.

______a. Rinse often to remove soil and debris from entire attachment.

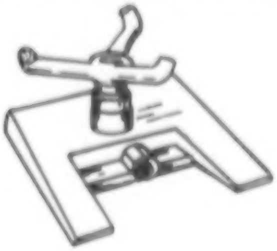
______b. Never lubricate the attachments.

______c. Store plastic attachments in sun when not is use.

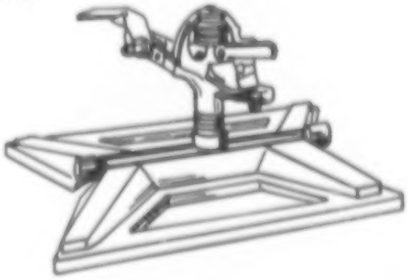
______d. Unclog jets and nozzle holes.

______e. Straighten or replace misshapen, cracked, or faulty attachments.

21. Identify the following general types of sprinklers.

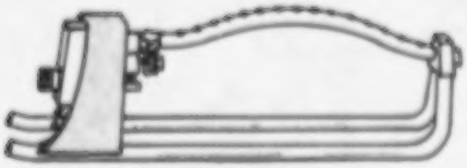


a. ______________________________

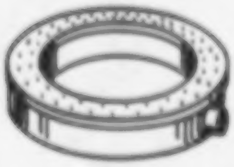


b. ______________________________

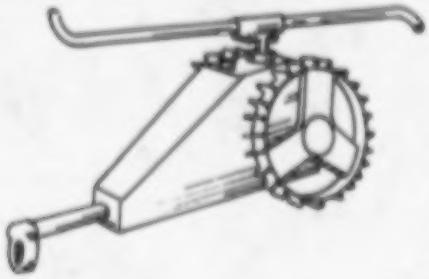
TEST



c. ______________________________



d. ______________________________



e. ______________________________

22. Match the types of sprinklers on the right with their correct characteristics.

_____a. Contains a row of nozzles in the single tube arm; produces a long, rectangular pattern.

_____b. Drags or rolls up hose as it moves; powered by water pressure; accepts various sprinkler heads.

_____c. Rotates as water strikes counter balance and spring activated arm; produces full or partial circle pattern up to 100' in diameter.

_____d. Has no moving parts; standard heads have various patterns of holes.

_____e. Has two or more spinning arms; produces a circular pattern or a locked narrow strip.

1. Fixed spray
2. Oscillating
3. Revolving
4. Impulse
5. Traveling

(NOTE: If the following activities have not been accomplished prior to the test, ask your instructor when they should be completed.)

23. Identify general plant symptoms resulting from excess or deficient water. (Assignment Sheet #1)

24. Sketch a sprinkler water pattern. (Assignment Sheet #2)

25. Measure the amount of water applied by a sprinkler. (Assignment Sheet #3)

26. Demonstrate the ability to repair a hose coupling. (Job Sheet #1)

WATER AND WATERING TECHNIQUES
UNIT IV

ANSWERS TO TEST

1.

a.	11	e.	5	i.	7
b.	17	f.	2	j.	8
c.	1	g.	13	k.	10
d.	14	h.	6	l.	4

2. b, c, e

3. a. Promotes deep rooting
   b. Maintains plant health and growth

4. a, b, d, g, i, j

5. Any two of the following:

   a. Presence of suspended particles such as sand, soil, or algae
   b. Presence of chemicals such as chlorine or water softeners
   c. High soluble salts or high sodium concentrations
   d. High or low pH

6. a, c, d, f, g

7. a. Any four of the following:

      1) Leaches fertilizer
      2) Reduces plant growth
      3) Increases erosion
      4) Compacts soil
      5) Increases irrigation costs
      6) Increases plant diseases
      7) Decreases rooting depth
      8) Decreases soil aeration

   b. Any two of the following:

      1) Reduces plant growth
      2) Promotes soil cracking
      3) Contributes to wind erosion of soil
      4) May completely kill plants causing increased cost for plant replacement

ANSWERS TO TEST

8. Any two of the following:

   a. Use water conservation methods.
   b. Select appropriate irrigation system.
   c. Use appropriate mulches.
   d. Install drainage systems.
   e. Select proper plants.

9. a. Any two of the following:

      1) Fine-textured, compacted soils
      2) Lack of surface and internal drainage
      3) Water accumulations in depressions
      4) Excessive irrigation or rainfall

   b. Any one of the following:

      1) Poor soil aeration
      2) Reduced number of roots and plant vigor
      3) Increased disease occurrence
      4) Increased soil compaction

10.

10.	a.	D	e.	DE
	b.	DE	f.	D
	c.	D	g.	E
	d.	E	h.	D

11.

11.	a.	4	e.	3
	b.	1	f.	2
	c.	3	g.	4
	d.	2	h.	1

12. a. Any two of the following:

       1) Conserves moisture (lessens evaporation and runoff)
       2) Reduces temperature fluctuations
       3) Suppresses weed growth

    b. Any two of the following:

       1) May attract rodents and other pests
       2) Requires periodic replacement due to deterioration and washing away
       3) May retain excess water during prolonged rainy periods

ANSWERS TO TEST

13. a. Skin
    b. Inner layers (plys)
    c. Core

14. a. Better
    b. Poor
    c. Best
    d. Good

15. a. Watering large yards, greenhouses, and nurseries
    b. Watering container plants (home use)
    c. Watering lawns and gardens

16. a. Hose end repair device
    b. In-line repair device
    c. Coupling

17. b, c, d, e

18. a. Twist-control nozzle
    b. Pistol grip nozzle
    c. Sweeper or cleaning nozzle
    d. Fan spray head
    e. Water breaker or bubbler
    f. Mist head
    g. Soaker hose
    h. Shut-off valve
    i. Wand (extension)

19. a. 3
    b. 4
    c. 6
    d. 2
    e. 1
    f. 5
    g. 8

20. a, d, e

ANSWERS TO TEST

21. a. Revolving (rotary)
    b. Impulse
    c. Oscillating
    d. Fixed spray
    e. Traveling

22. a. 2
    b. 5
    c. 4
    d. 1
    e. 3

23.-25. Evaluated to the satisfaction of the instructor

26. Performance skills evaluated to the satisfaction of the instructor

PLANTING AND MAINTAINING PLANT BEDS
UNIT V

UNIT OBJECTIVE

After completion of this unit, the student should be able to distinguish between the various classes of plant materials and the techniques involved in planting and maintaining them in the landscape. Competencies will be demonstrated by completing the job sheets and the unit tests with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to planting and maintaining plant beds with the correct definitions.
2. Match classes of plants according to growth habits with the correct definitions.
3. Match classes of plants according to landscape form and use with the correct descriptions.
4. Identify classes of plants according to root forms.
5. Distinguish between the various root forms.
6. Answer questions on procedures for handling various plant materials.
7. Answer questions on techniques for planting/transplanting plant materials.
8. Identify the methods for staking plant materials.
9. Complete statements on rules for staking.

OBJECTIVE SHEET

10. Select true statements on trimming and grooming practices.
11. List requirements for a good mulch.
12. List types of mulches and their characteristics.
13. List reasons for replacing mulch materials.
14. List reasons for replacing plant materials.
15. Demonstrate the ability to
    a. Plant a balled and burlapped tree or shrub. (Job Sheet #1)
    b. Plant a bareroot plant. (Job Sheet #2)
    c. Plant a container grown plant. (Job Sheet #3)
    d. Plant bedding plants. (Job Sheet #4)

PLANTING AND MAINTAINING PLANT BEDS
UNIT V

SUGGESTED ACTIVITIES

A. Obtain additional materials and/or invite resource people to class to supplement/reinforce information provided in this unit of instruction.

(NOTE: This activity should be completed prior to the teaching of this unit.)

B. Provide students with objective sheet.

C. Discuss unit and specific objectives.

D. Provide students with information sheet.

E. Discuss information sheet.

F. Provide students with job sheets.

G. Discuss and demonstrate the procedures outlined in the job sheets.

H. Integrate the following activities throughout the teaching of this unit:

1. Plan a field trip to a nursery shipping yard or contractors' yard to view large equipment.
2. Visit a nursery, greenhouse, or landscaping firm to compare types of plant materials and root forms.
3. Invite a representative of a groundskeeping firm to speak to the class.
4. Send for catalogs of plant materials from seed companies and nurseries.
5. Discuss and demonstrate different types of hand tools.
6. Demonstrate or show pictures of a tree spade in operation.
7. Provide and demonstrate power equipment to be used to complete Job Sheets 1-4.
8. Review safety procedures involved in operating selected power equipment.
9. Discuss the advantages and disadvantages of tree wrapping and show samples of tree wrap materials.
10. Discuss and show samples of mulching materials.
11. Discuss the specific cultural requirements of plant materials to be used in Job Sheets 1-4.
12. Review appropriate sections of Units II, III, and IV.

SUGGESTED ACTIVITIES

13. Discuss and show samples of soil amendments.

14. As a class, locate and discuss the good and bad aspects of work sites for Job Sheets 1-4.

15. Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas for improvement.

I. Give test.

J. Evaluate test.

K. Reteach if necessary.

RESOURCES USED IN DEVELOPING THIS UNIT

A. Ingles, Jack E. *Ornamental Horticulture: Principles and Practices*. Albany, NY: Delmar Publishers, Inc., 1985.

B. Halfacre, R. Gordon, and John A. Barden. *Horticulture*. New York: McGraw-Hill Book Company, 1979.

C. Janick, Jules. *Horticultural Science*. New York: W.H. Freeman and Company, 1986.

D. Ingles, Jack E. *Landscaping: Principles and Practices*. Albany, NY: Delmar Publishers, Inc., 1987.

E. Hannehaum, Leroy G. *Landscape Operations: Management, Methods, and Materials*. Reston, VA: Reston Publishing Company, 1980.

F. *Basic Gardening*. Sunset Books, Menlo Park, CA: Lane Publishing Co., 1976.

G. *Competency Based Horticulture: Gardening-Groundskeeping*, Illinois State Board of Education, June 30, 1981.

H. Geer, Barbara. *Basic Horticulture*. Stillwater, OK: State Department of Vocational and Technical Education, 1981.

SUGGESTED SUPPLEMENTAL RESOURCES

A. Sources for vegetable and bedding plant seeds

1. Northrup King Seeds
   Pacific Division Headquarters
   P.O. Box 12123
   Fresno, California 93776

SUGGESTED SUPPLEMENTAL RESOURCES

2. Northrup King Co.
   1500 Jackson St. N.E.
   Minneapolis, Minnesota 55413

3. George Ball Pacific, Inc.
   111-A Uranium Road
   Sunnyvale, California 94088

4. W. Atlee Burpee Co.
   6350 Rutland Avenue
   Box 748
   Riverside, California 92502

5. George W. Park Seed Company, Inc.
   P.O. Box 31
   Greenwood, South Carolina 29647

6. Vaughn's Seed Company
   5300 Katrine Avenue
   Downers Grove, Illinois 60515

7. Burgess Seed and Plant Company
   P.O. Box 3001
   Galesburg, Michigan 49053

8. Michell's
   P.O. Box 160
   King of Prussia, Pennsylvania 19406

9. Gloeckner & Company, Inc.
   15 East 26th Street
   New York, New York 10010

B. Pruning equipment

1. Bishop Company
   P.O. Box 870
   7036 Bright Avenue
   Whittier, California 90608

2. Corona Clipper Company
   14200 East Sixth Street
   P.O. Box 730
   Corona, California 91720

3. Fanno Saw Works
   P.O. Box 628
   Chico, California 95927

4. A.H. Gutbrod Company
   P.O. Box 1111
   Sun City, Arizona 85351

SUGGESTED SUPPLEMENTAL RESOURCES

C. Audio-visual presentations

The following programs include slides, cassette recordings, and written scripts. These are available to educators at member prices from the following:

American Association of Nurserymen (AAN)
Member Services
1250 "I" Street, N.W., Suite 500
Washington, DC 20005
202/789-2900

1. *Care & Handling of Balled and Potted & Balled and Burlapped Plant Material*
2. *Care & Proper Handling of Bare Root Plants in the Nursery*
3. *Shipping and Handling Container Grown Ornamental Plant Material*

PLANTING AND MAINTAINING PLANT BEDS
UNIT V

INFORMATION SHEET

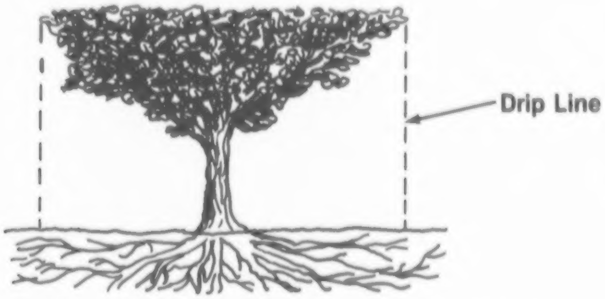
I. **Terms and definitions**

A. Crown — The portion of a plant at the junction of the root and stem or trunk

B. Cuttings — Detached vegetative plant parts which have the ability to develop roots and shoots forming a new plant

C. Dormant — Not actively growing, but capable of resuming growth when environmental conditions become favorable

D. Drip line — An imaginary line drawn from the outside limb tips of a tree or shrub down to the ground



E. Edging — Border which helps to retain plants within an area and retard unwanted plants from spreading into the area

F. Foliage — Collectively, the leaves of a plant

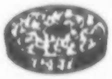
G. Hardening off — Acclimating plants to environmental conditions

H. Heaving — Alternate freezing and thawing of the soil which can force small plant materials out of the ground

I. Heeling in — Temporary storage of plant materials in a shallow ditch or trench with moisture-conserving materials or soil covering the root system

J. Mulch — Any loose, dry material such as straw, leaves, peat, etc. used as a thin protective covering over the soil

K. Peat pellets — Compressed peat and soilless growing mix which expands when wet to form small pot-like containers used for seeds, cuttings, and seedlings



Peat pellet

INFORMATION SHEET

L. Rhizomes — Underground rootlike stems producing leafy shoots above and roots below

M. Shingle-tow — Shaved wood used to retain moisture around packaged plants

N. Soil amendment — Chemical or mineral element added to the soil to improve soil characteristics

O. Starter solution — A dilute fertilizer solution applied following transplanting to provide water and quickly-available nutrients

(NOTE: Starter solutions are usually high in phosphorus to promote root development.)

P. Stolons — Stems growing horizontally on or below the soil surface forming leaves and roots at the nodes

Q. Sunscald — Damage resulting from drying and blistering of plant tissue

R. Tree wrap — Protective wrappings around the tree trunk which help to prevent sunscald, dried bark, and trunk borer damage

II. Classes of plants according to growth habits

A. Woody plants — Plants having a protective outer layer of bark and inner layer of annual growth rings; persist above ground from year to year in zones where they are hardy

1. Deciduous — Plants that loose their foliage at the end of the growing season

2. Evergreen — Plants that retain most of their foliage throughout the year

B. Herbaceous plants — Plants having more or less soft or succulent tissue (not woody)

1. Perennials — Plants that continue to live year after year; tops may die in cold climates, but roots and rhizomes persist

2. Annuals — Plants that complete their life cycle in one growing season

3. Biennials — Plants that complete their life cycle in two years; produce leaves the first year; flowers, fruit, and seeds the second year; and then die

INFORMATION SHEET

III. **Classes of plants according to landscape form and use**

A. Trees — Woody, perennial plants usually having a single main axis or stem (trunk) and usually exceeding ten feet in height at maturity

1. Shade trees — Trees grown primarily for their broad-spreading form creating shade in the landscape

2. Ornamental trees — Trees with outstanding form, flowers, or foliage grown primarily for decorative effect in the landscape; usually smaller than shade trees

3. Windbreaks — Columnar trees or low-branching trees grown primarily to shield certain areas from undesirable winds

B. Shrubs — Woody, perennial plants usually having multiple stems and usually smaller than a tree

C. Vines — Woody or herbaceous perennial plants whose stems require support from other plants or objects

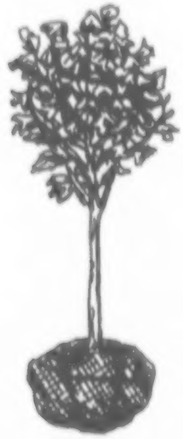
D. Ground covers — Low growing, spreading plants used to cover areas, exclude undesirable plants, or prevent erosion

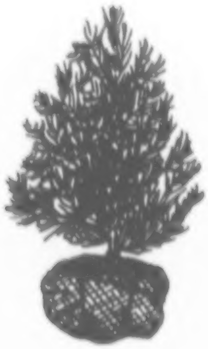
E. Bedding plants — Plants (primarily annuals) preplanted and growing in small packets for transplanting in groups to cover a prescribed area (bed); used for their showy flowers or foliage effect in the landscape

IV. **Classes of plants according to root forms**

A. Balled and burlapped (B&B) — Plants dug with more of their roots and soil left intact

Examples: Larger trees and shrubs

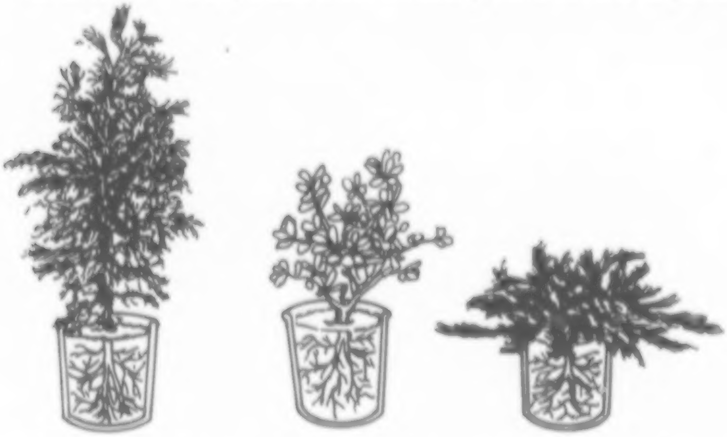




INFORMATION SHEET

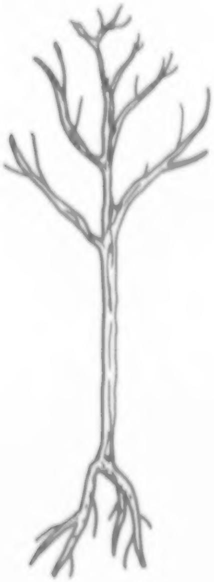
B. Container grown — Plants usually grown in 1 to 5 gallon containers and transplanted with all roots intact

Examples: Young trees, most shrubs, ground covers, large bedding plants



C. Bareroot — Dormant plants, field grown, and dug leaving no soil on the roots

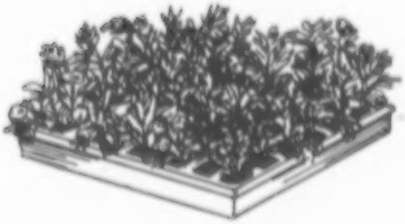
Examples: Deciduous trees, shrubs, few seedling evergreens

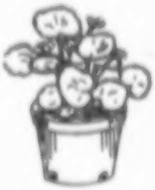


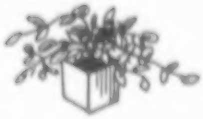
INFORMATION SHEET

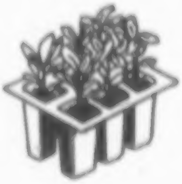
D. Small packet or package — Plants grown in small containers usually less than 1 gallon in size

Examples: Bedding plants, ground covers, vines



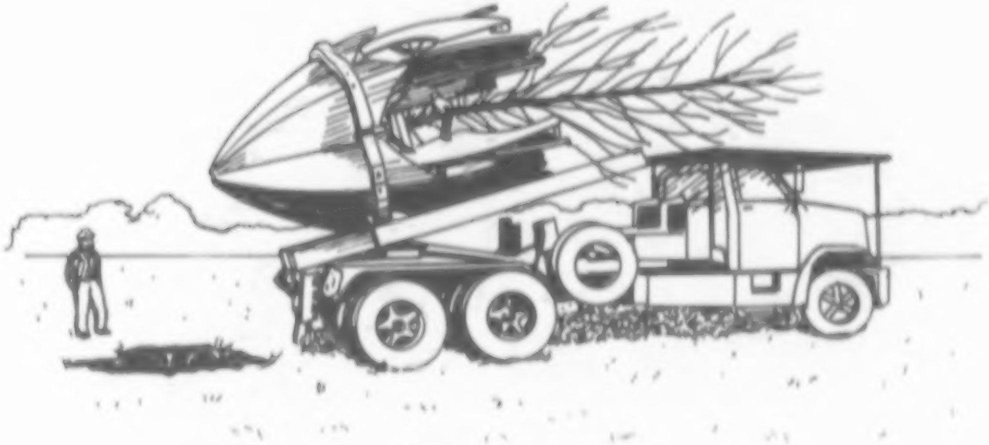






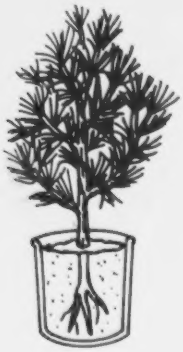
E. Special forms

1. Tree spaded tree — Tree dug up by a tree spade with a large percentage of roots and soil intact and transplanted directly to the site; allows immediate landscape effect of larger trees



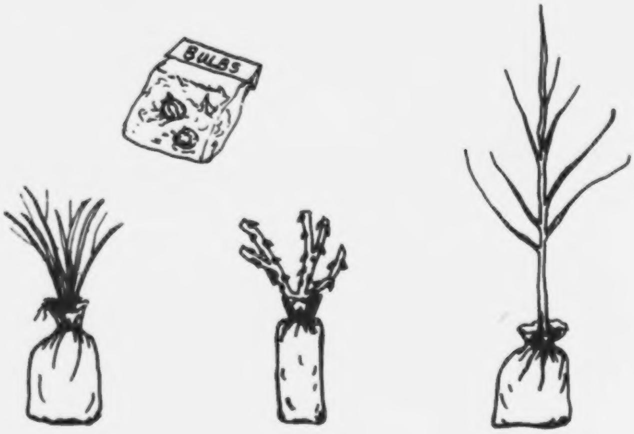
INFORMATION SHEET

2. Containerized — Bareroot plants placed in various-sized gallon containers; roots are not as established as container grown plants



3. Limited use containers — Papier-maché pots, machine made balls, and polyethylene bags commonly used for quick, mass sales of common plants by discount stores and large garden stores

   Examples: Field grown trees, fruit trees, shrubs, rose bushes, perennials, seedlings, summer bulbs



INFORMATION SHEET

V. Characteristics of various root forms

A. Balled and burlapped plant materials

1. Less disruption of root systems
2. Very expensive root form method
3. Plants are heavy and bulky to ship.
4. May require larger equipment for harvest, transporting, and planting
5. Allows harvest of larger trees and shrubs
6. Root coverings of burlap, plastic mesh or webbing, or wire baskets

B. Bareroot plant materials

1. Severely reduced root system
2. Inexpensive root form method
3. Lightweight, easy to transport
4. Plants may be sent mail order.
5. Roots are covered with moisture-retaining peat, plastic wrap, or shingle tow for shipping.
6. Smaller deciduous trees or shrubs are harvested while dormant.
7. Plants have limited storage life.

C. Container grown plant materials

1. Plants have intact root systems and are grown in the container.
2. Less expensive than B&B but more than bareroot
3. Growing media adds weight for handling and transport.
4. Containers are commonly made of metal or heavy plastic.
5. Can be maintained or "held" for long periods but may become rootbound.

INFORMATION SHEET

D. Small packaged plant materials

1. Plants are seeded, rooted, and grown in these containers with roots intact.

2. Lightweight, easy to transport

3. Package forms may be peat or plastic pots, cell packs, bands, peat pellets, clay pots, paper or poly bags.

4. May provide one season interest.

   Examples: Annuals, chrysanthemums, pansies

VI. **Procedures for handling plant materials** (Job Sheets #1-#4)

A. **Inspect plant materials. Check for broken, rubbed, or frozen limbs.**

1. Balled and burlapped (B&B) — Check root bindings to make sure they are secure but not constricting.

2. Container grown — Discard or treat and isolate diseased and insect-infested plants.

   (NOTE: Know your company policy concerning unusable plants received from a supplier before unloading.)

3. Bareroot — Prune damaged roots and discard diseased plants.

4. Small packaged plants — Discard diseased or insect-infested plants.

B. **Correct any problems such as damaged wrappings or pots.**

1. Balled and burlapped — Replace torn or deteriorated wrappings, rope, or twine, especially after long periods of storage.

2. Container grown

   a. Replace damaged, unusable pots, washed out growing media, and missing identification tags.

   b. Repot usable overgrown plants.

3. Bareroot — Remove packing materials and bindings.

4. Small packaged materials

   a. Remove dead foliage and flowers; prune leggy plants.

   b. Repot usable plants if needed.

   c. Replace or add identification tags.

INFORMATION SHEET

C. **Protect from adverse climatic conditions.**

1. Balled and burlapped — Heel in or mulch.

2. Container grown

   a. Group on weed mats or bare ground, and mulch if necessary.

   b. Build or move to structures for protection.

   Examples: Plastic greenhouses, lathe house, windbreaks

3. Bareroot

   a. Heel in or mulch.

   b. Place at proper temperature and humidity.

   (NOTE: Plants are received in a dormant state and should not be stored for long periods.)

4. Small packaged materials — Group on weed mats, bare ground, or in greenhouses.

   (NOTE: Grouping plants close together helps maintain moisture. However, those around the outside edges will dry quicker requiring supplemental watering.)

D. **Water as needed.**

1. Balled and burlapped

   a. Maintain an evenly moist root ball.

   b. Use drip line or sprinklers on hard-to-wet burlap.

   (CAUTION: Too much water may cause burlap to deteriorate.)

2. Container grown

   a. Dry out more rapidly than heeled in B&B or bareroot plants.

   b. Use sprinklers, drip lines, and/or hand watering.

3. Bareroot

   a. Maintain high humidity level in storage coolers and keep mulching materials evenly moist.

   b. Use sprinklers, misters, or hand watering for plants heeled in.

INFORMATION SHEET

4. Small packaged materials

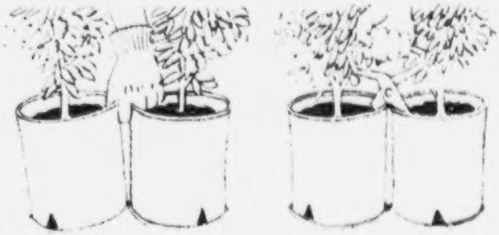
   a. Plants wilt readily and dry out unevenly due to different soil mixes, pot sizes, and plant types.

   b. Use sprinklers and hand watering.

E. **Pick up plants properly.**

1. Balled and burlapped — Grasp rootball or rope bindings, *not trunk or crown*.

2. Container grown — Pick up pots with special can carriers, gloved hands, or in groups on a pallet, not by trunk or crown.



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3. Bareroot — Grasp trunk or limbs gently.

4. Small packaged materials — Group into trays or flats and lift in groups.

F. **Protect from dehydration and bruising in transit.**

1. Transport in closed trucks or cover with tarps on open truck beds.

2. Bind or wrap flexible limbs.

   (CAUTION: Wet foliage of recently watered plants will promote disease when tightly covered or closed in an unventilated truck. Do not leave a plant load in the full sun without adjusting coverings.)

INFORMATION SHEET

VII. **Techniques for planting/transplanting materials** (Job Sheets #1-#4)

A. **Timing** — Ideally roots should be given the chance to develop before shoots and foliage begin growing. The best times for planting will vary from region to region. (Assignment Sheet #1)

B. **Planting depth** — All root systems should be placed deep enough to allow the crown to be even with the surrounding surface or at the previously grown depth.

(NOTE: Certain conditions and planting soils may require special planting depths.)

C. **Plant spacing** — Spacing should allow plants to reach mature size without restricting their natural form.

(NOTE: Some plants may be spaced closely to form thick hedges or solid ground cover.)

D. **Hole size** — The hole should be large enough to accommodate the root system without causing unnatural bending, twisting, or wrapping of roots.

(NOTE: Many opinions have been expressed about proper hole sizes ranging from 6" wider and deeper than the root system to 50% wider and deeper.)

E. **Fertilization** — Adding nutrients at planting time can be beneficial if slow-release types or low concentrations are applied and care is taken to keep material from direct contact with roots or foliage.

F. **Water** — Plants should be watered before transplanting, during backfilling, and after final leveling around plant.

G. **Staking** — Plants should be staked *only if absolutely necessary*.

H. **Clean up**

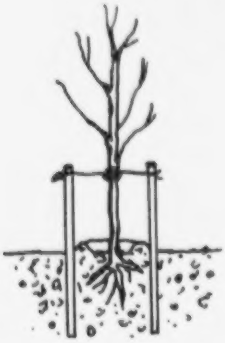
1. Dispose of all discarded pots, wrapping, tags, sod, weeds, and excess soil.
2. Remove wires of all tags remaining on plant materials.
3. Rake fresh soil off sod and smooth surface area.
4. Form a neat basin or saucer from excess soil around trees and shrubs for water conservation.
5. Redefine bed edges if necessary.

INFORMATION SHEET

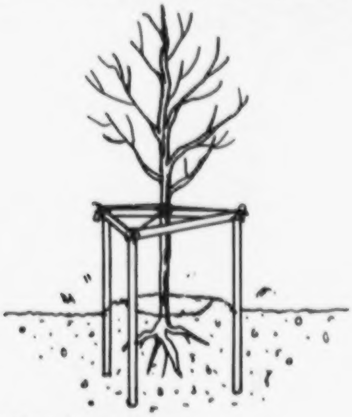
VIII. Common methods of staking plant materials

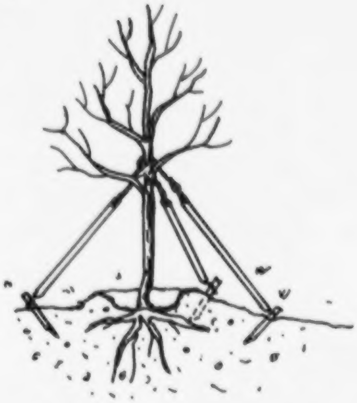
A. Two-stake method (Small to medium trees)

(NOTE: One stake should be toward the prevailing wind for time of year planted.)



B. Three-stake method (Large trees)





IX. Rules for staking

A. Remove staking materials as soon as roots become established.

B. Wrap wires or place through sections of garden hose, or use other soft material strips or cotton ropes.

C. Stakes driven close to plants should not touch stems or trunks.

D. Check all wires and stakes after wet or windy weather conditions.

(CAUTION: Do not use eye bolts screwed into the trunk. These can provide entry points for insects and diseases.)

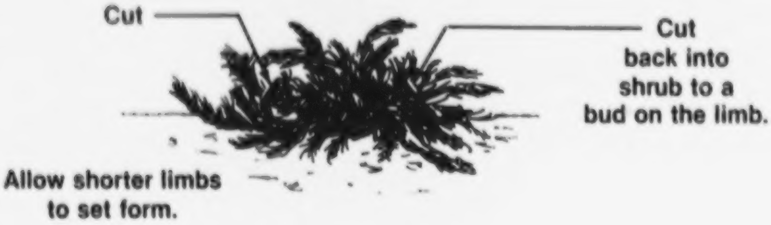
INFORMATION SHEET

X. **Trimming and grooming practices**

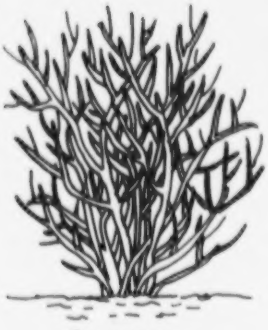
A. Remove branch tips.

1. Bring large evergreen and deciduous plants into bounds by removing longer branch tips and older growth allowing the shorter, younger branches to set the form.

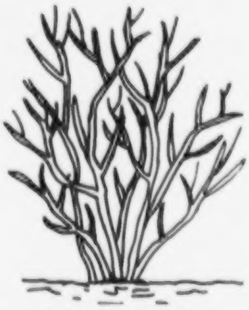
Example: a. Spreading junipers


Cut
Cut back into shrub to a bud on the limb.
Allow shorter limbs to set form.

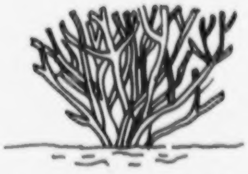
b. Deciduous shrubs



Overgrown

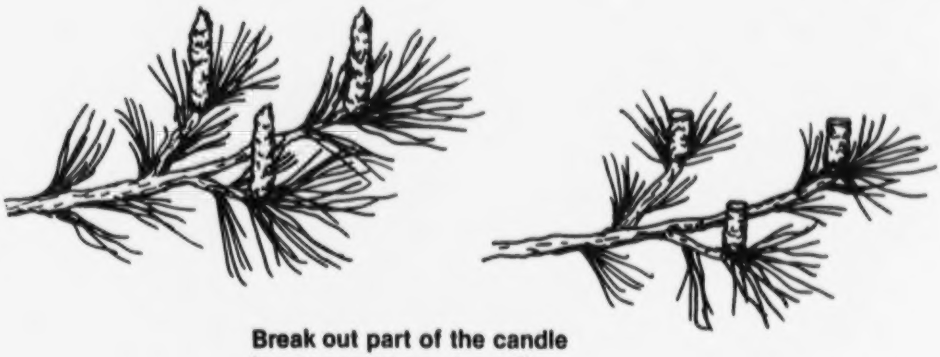


Correctly Pruned



Incorrectly Pruned

2. Pine trees may be kept more dense by breaking out part of the candle before needles emerge in the spring.

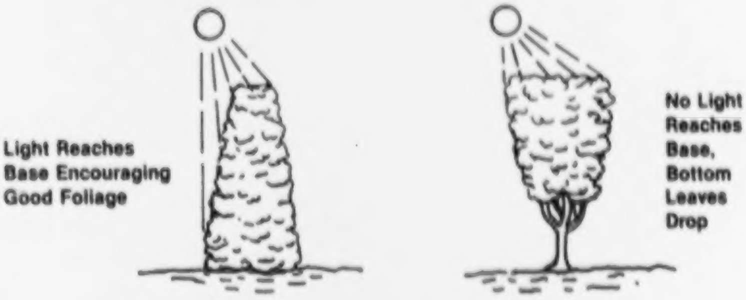


Break out part of the candle to encourage new growth.

INFORMATION SHEET

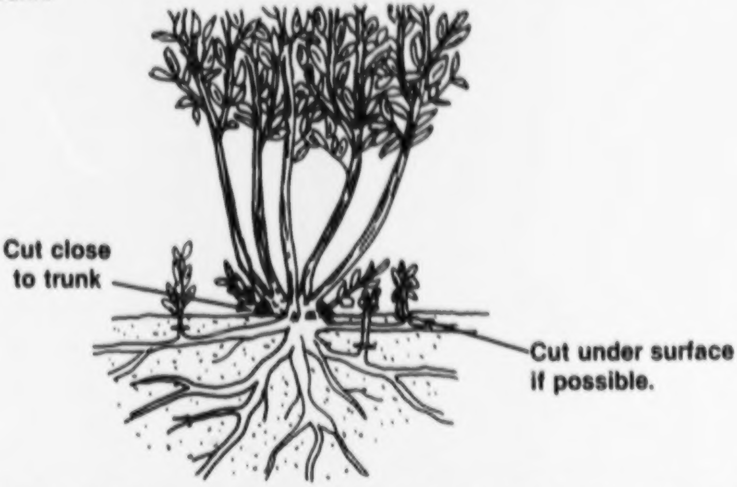
B. Shear hedges — Cut soft new growth usually in early spring and then as needed to maintain neat compact growth.

Example: Privet


Light Reaches
Base Encouraging
Good Foliage
No Light
Reaches
Base,
Bottom
Leaves
Drop

Correct Incorrect

C. Remove suckers — Cut suckers under the soil surface or flush with the trunk.

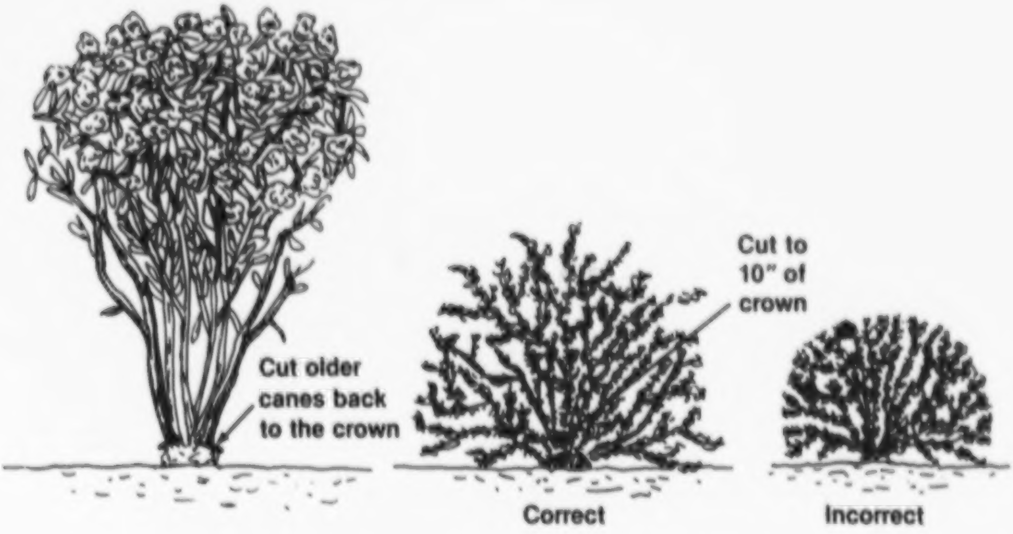

Cut close
to trunk
Cut under surface
if possible.

Example: Yaupon holly plants must be inspected and suckers removed monthly. Buds sprouting on cleared limbs can be rubbed off.

INFORMATION SHEET

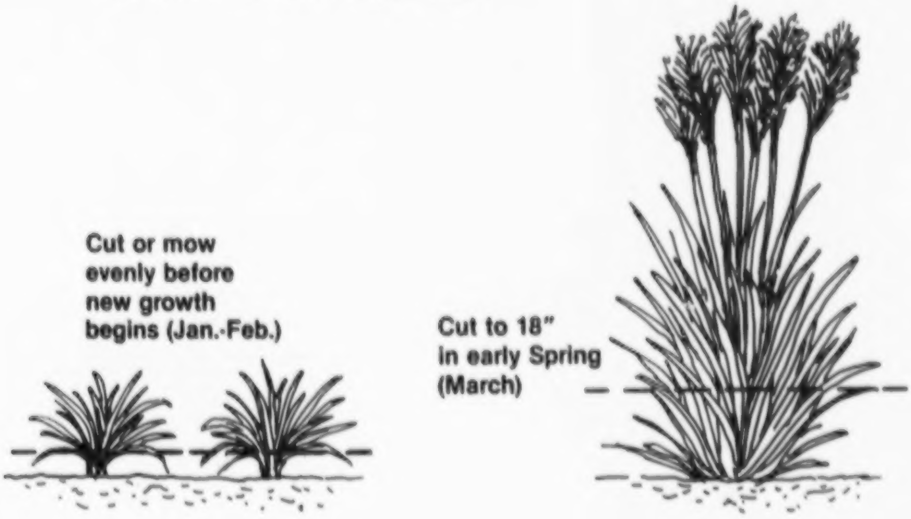
D. Remove old canes — Maintain natural shape by thinning out older canes.

Examples: Winter jasmine, forsythia, nandina


Cut older canes back to the crown
Cut to 10" of crown
Correct
Incorrect

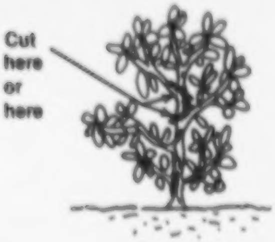
E. Remove top growth — Cut away above-ground growth to provide space for new growth.

Examples: Liriope, pampas grass

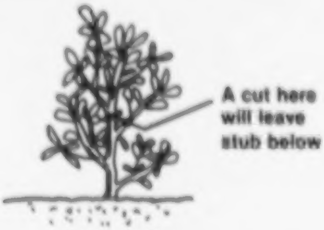

Cut or mow evenly before new growth begins (Jan.-Feb.)
Cut to 18" in early Spring (March)

INFORMATION SHEET

F. Remove dead, damaged, or diseased limbs — Prune 12" below any disease. Cut limbs to a bud or branching "Y". Do not leave a stub.



Correct


A cut here will leave stub below

Incorrect

G. Remove dead flowers and foliage — Faded flower heads should be removed to prevent seed heads from forming. Dead foliage could promote disease or insect populations.

H. Collect all trash and plant debris.

I. Rake and smooth mulch and soil surfaces.

J. Hoe weeds and unwanted grass — Hoeing weeds will be easier if the soil is moist. Use shallow, short strokes to uproot unwanted plants.

XI. Requirements for a good mulch

A. Holds moisture

B. Is attractive

C. Controls weeds

D. Controls erosion

E. Prevents rapid temperature fluctuations

F. Does not compact easily

G. Does not wash or blow away

H. Does not tie up nutrients

I. Is not a fire hazard

J. Should not encourage disease development

INFORMATION SHEET

XII. **Types of mulches and their characteristics**

TYPES	CHARACTERISTICS
A. Peat	Not a mowing hazard, attractive, various grades, retains water well, fibrous or powdery, hard to wet, deteriorates, scatters in the wind, expensive for large areas.
B. Bark	Not a mowing hazard, attractive but turns gray with exposure, various sizes, fire hazard if very dry, washes away, needs to be replaced every 1 to 2 years.
C. Manure bedding	Variable expense, available, strong odor initially, contains weed seeds, straw, or wood shavings, must be decomposed before use, molds, may pack down.
D. Pecan shells, almond hulls	Attractive, uniform, extremely durable, limited availability, expensive.
E. Ground corn cobs	Molds, limited availability, turns gray, controls weeds.
F. Sawdust, wood shavings	Decomposes slowly, not uniform — contains chips, splinters, packs down, may attract insects, low in plant nutrients.
G. Pine needles	Attractive, durable, limited availability, will not pack.
H. Peanut hulls, cottonseed hulls	Durable, packs down, attractive to rodents, molds, retains too much water in a rainy season. May carry verticillium wilt which affects some plants.
I. Tree leaves, lawn clippings	Excellent humus, packs down, readily available, may contain herbicides, scatters, washes, decomposes rapidly.
J. Hay, straw	Inexpensive, readily available, controls erosion, limited life, must be replaced often, packs, unattractive, scatters, flammable.
K. Crushed stone, marble chips, brick chips, river rock	Durable, attractive, mowing hazard, heavy, light colors discolor, nonflammable, limited use, crushed stone adds calcium.

INFORMATION SHEET

TYPES		CHARACTERISTICS
L.	Shredded tires	Durable, limited availability, unattractive, flammable.
M.	Plastic	Inexpensive, black retards weed growth, heat buildup, sheds water, deteriorates, slippery.
N.	Fiber mats	Limited weed control — quack grass will grow through mat and seeds will germinate on mats, commonly used under other mulches, allows water and air penetration, expensive, deteriorates if exposed to sunlight.

XIII. Reasons for replacing organic or inorganic mulching materials

A. Decomposed

B. Washed away

C. Weed seeds germinate

D. Decline in appearance

(NOTE: Old mulching materials should be removed before adding new material to prevent layers building up or burying and killing plants.)

XIV. Reasons for replacing plant materials

A. Plants are dead or damaged. (Handout #1)

B. Plants are overgrown or unattractive.

C. Plants are leggy or too open in the centers and cannot be rejuvenated.

D. Perennials, especially flowering plants, multiply and need to be divided.

Examples: Iris, shasta daisy, liriope

PLANTING AND MAINTAINING PLANT BEDS
UNIT V

HANDOUT #1 — DISEASE DIAGNOSIS OF ORNAMENTAL PLANTS

Poor growth of ornamental plants can be due to a wide variety of causes, and diagnosis of the cause can be quite difficult. This key has been prepared as an aid in diagnosing growth difficulties. Remember, poor growth can be caused by several factors which may include insects and diseases.

Shrubs stunted, weak growth, poor leaf color, limbs gradually dying

1. Poor soil preparation
2. Drought damage
3. Poor soil drainage
4. Planting too deeply
5. Improper soil pH
6. Damage to stem
   a. Cold damage
   b. Lawn mower damage
   c. Borer damage
   d. Stem breakage
7. Nematode damage
8. Root rot damage
9. Vascular plugging (bacteria and fungi)
10. Herbicide damage
11. Improper nutrition
12. Bacterial fire blight (some shrubs)

Shrubs dying suddenly

1. Overfertilization
2. Root rot diseases or insects attacking root system
3. Severe drought damage
4. Leakage from underground gas lines
5. Herbicide damage

Leaf Chlorosis

1. Poorly drained soil
2. Deficiency or excess of nutrients
3. Improper pH
4. Nematode damage to root system
5. Damage to stem (mechanical or pathogen)
6. Poor soil preparation
7. Root rot diseases
8. Fungus or virus infection of leaves
9. Vascular plugging (bacteria and fungi)
10. Herbicide

Source — Oklahoma Extension Service

Browning of margin or tips of leaves

1. Cold damage
2. Root loss due to recent transplanting
3. Poor soil drainage
4. Poor soil preparation
5. Excessive fertilization
6. Root rot diseases
7. Mechanical damage to stem
8. Fungus
9. Nutritional deficiency

Shrubs failing to flower

1. Shrubs too young
2. Excessive vegetative growth
3. Diseases
4. Damage to bud
5. Overfertilization
6. Requires an opposite sex plant in the area

Failure to produce berries

1. Cold or frost damage during flowering period
2. Plant is male or noncompatible
3. Improper pruning
4. Fungus, virus, or bacterial disease
5. Insect damage
6. Nutritional imbalance or excess
7. Plant is female and requires pollen from a male plant

Loss of berries before maturity

1. Fungus disease attacking berries
2. Drought damage
3. Insect damage
4. Phytotoxicity
5. Embryo abortion

PLANTING AND MAINTAINING PLANT BEDS
UNIT V

ASSIGNMENT SHEET #1 — DETERMINE APPROPRIATE TIMES FOR TRANSPLANTING

NAME ______________________ SCORE ____________

Directions: Use the following chart to select the planting times best suited for your region.

	Balled and Burlapped	Container Grown	Bareroot	Small Packs
Early Winter				
Winter				
Early Spring				
Spring				
Early Summer				
Summer				
Early Fall				
Fall				

PLANTING AND MAINTAINING PLANT BEDS
UNIT V

JOB SHEET #1 — PLANT A BALLED AND BURLAPPED TREE OR SHRUB

A. Tools and materials

1. Balled and burlapped tree or shrub
2. Spades
3. Shovels
4. Hoes
5. Pick
6. Wheelbarrow or piece of tarp or plastic sheeting
7. Ballcart or piece of tarp or canvas
8. Forks
9. Scoops
10. Measuring device (tape, yardstick)
11. Watering hose
12. Knife
13. Fertilizer if needed
14. Mulching material if needed
15. Pruning tools if needed
16. Wrapping materials if needed
17. Staking materials if needed
18. Larger equipment selected by your instructor

    Examples: Front end loader, block and tackle, ropes
19. Soil amendments if needed

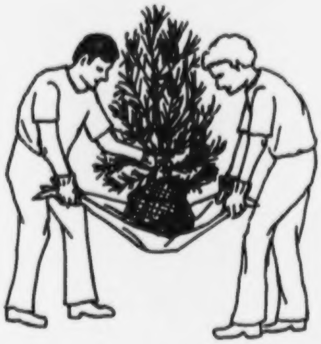
JOB SHEET #1

B. Procedure

1. Move selected plant from holding area to the job site.

   (Note: More than one person may be needed to handle a balled and burlapped plant. Smaller B & B plants can be rolled onto a tarp or canvas and carried between students if a ballcart is not available.)

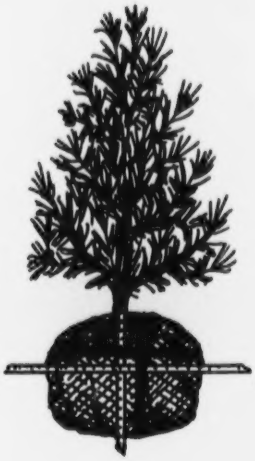
   FIGURE 1



2. Cover rootball to prevent drying while hole is prepared.
3. Remove sod and weeds from site.
4. Moisten and cover sod if it is to be replaced around finished planting.
5. Measure the width and depth of the root ball with a measuring tape or yardstick. (A tool handle can be used as a gauge if needed.)

   (CAUTION: Measuring the size of the plant is better than lifting it in and out of the hole to see if it fits. This can loosen the soil ball causing serious damage to the trunk and even breaking away portions of roots.)

   FIGURE 2



Width of rootball ____________________

Depth of rootball ____________________

JOB SHEET #1

6. Dig a flat-bottomed, straight-sided hole deep enough to accommodate the rootball and wide enough to allow backfilled soil to be added. (In general, width of hole should be twice the width of the root ball.)

   (NOTE: Shovels and augers used to dig holes may cause sheer, glazed sides that can restrict root growth. Loosen or score these glazed surfaces.)

7. Place dirt removed from hole in a wheelbarrow or on a piece of tarp or plastic sheeting.

8. Condition or texturize soil removed from the hole by adding amendments, breaking up clods, and mixing well.

   (NOTE: Amendments are used to alter pH, water holding capacity, or texture, or to add needed nutrients. Thorough mixing is essential to avoid layering effect which can disrupt water movement.)

9. Remove plastic mesh, constricting ropes, twine, wire, and tags.

10. Place plant in the hole with the trunk or crown level with the surrounding soil surface or at the same depth as previously grown.

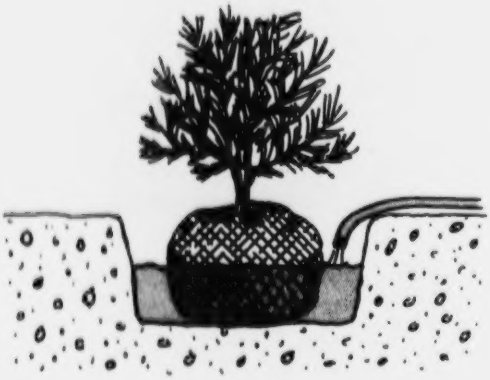
    (NOTE: If hole is too deep, remove plant and add soil. Firm any soil added to prevent settling.)

11. Straighten plant in hole, viewing it from all sides.

12. Backfill a 5" or 6" soil layer evenly around ball.

13. Apply water to settle soil and remove air pockets.

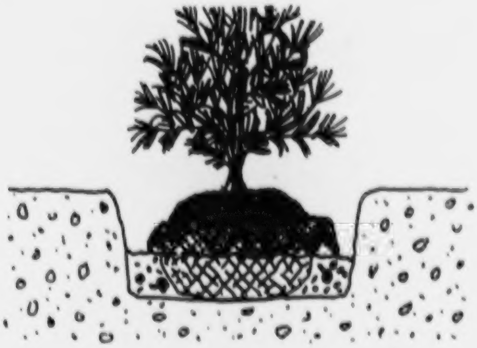
    FIGURE 3



JOB SHEET #1

14. Loosen burlap on the upper 1/3 of the ball, folding material back to bury as final layers of soil are added.

FIGURE 4



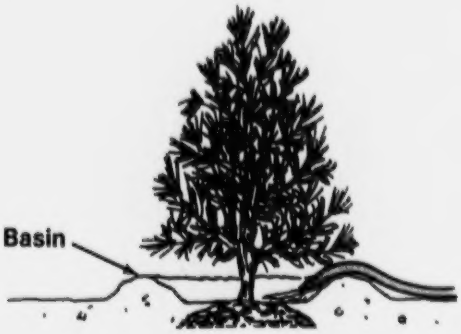
15. Continue to add backfill dirt and water to settle dirt and remove air pockets.

16. Level soil to surrounding surface contour.

17. Construct a basin from excess soil around the plant with a 4" to 6" ridge to serve as a water reservoir.

18. Fill basin with water.

FIGURE 5



19. Remove any labels which might restrict future growth.

JOB SHEET #1

Steps 20 thru 25 are not required in every planting job. Your instructor will select those required to complete this job.

20. Apply fertilizer evenly to soil surface keeping one foot from trunk and avoiding contact with foliage.

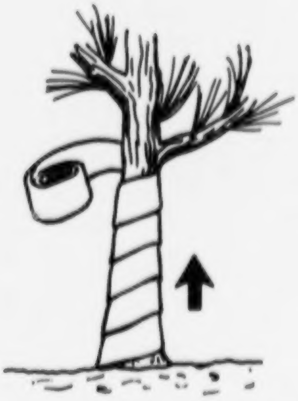
21. Spread a 4" layer of mulch around the plant.

22. Replace sod up to outside basin walls.

23. Prune to remove damaged limbs and to establish plant structure.

24. Apply tree wrap beginning at the base, wrapping upward, overlapping strips slightly to the first branch.

FIGURE 6



25. Stake trees.

(NOTE: Stakes may be added during or after planting.)

26. Clean area and discard all tags, wrappings, and excess soil.

27. Clean and return tools and materials to correct areas.

PLANTING AND MAINTAINING PLANT BEDS
UNIT V

JOB SHEET #2 — PLANT A BAREROOT PLANT

A. Tools and materials

1. Bareroot plant
2. Spades
3. Shovels
4. Hoes
5. Pick
6. Wheelbarrow or piece of tarp or plastic sheeting
7. Forks
8. Scoops
9. Measuring device (tape, yardstick)
10. Watering hose
11. Fertilizer if needed
12. Mulching material if needed
13. Pruning tools if needed
14. Wrapping materials if needed
15. Staking materials if needed

B. Procedure

1. Move selected plant from holding area to the job site.
2. Remove plant from any packaging.
3. Prune damaged roots. Check with your instructor to see if you should also prune ½" from ends of all roots pencil size or larger to encourage new rooting.
4. Moisten and cover roots to prevent drying out while preparing hole.

JOB SHEET #2

5. Remove sod and weeds from site.

6. Moisten and cover sod if it is to be replaced around finished planting.

7. Measure roots with a measuring tape or tool handle.

8. Dig a straight-sided hole large enough to accommodate roots and allow back-filled soil to be added.

   (NOTE: In very warm dry conditions, fill the empty hole with water and let it completely drain away.)

9. Place dirt removed from hole in a wheelbarrow or on a piece of tarp or plastic sheeting.

10. Condition or texturize soil removed from the hole by adding amendments, breaking up clods, and mixing well.

11. Place plant in hole to the same depth previously grown as indicated by a stain or discolored area on the bark.

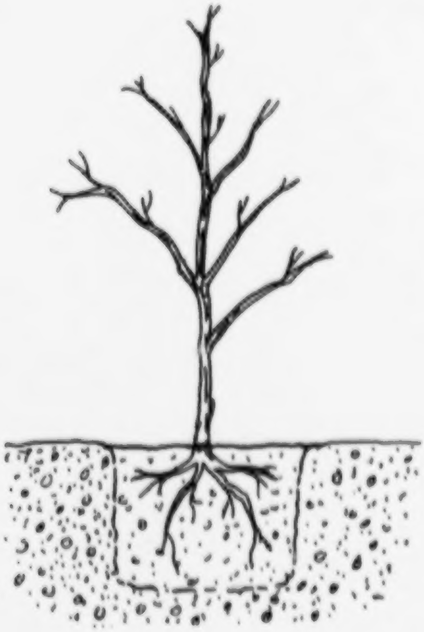
    (NOTE: Planting depths may vary with regional conditions or types of plant materials.)

12. Straighten plant, being sure to view from all sides.

    (NOTE: Staking should not be used to straighten a plant after transplanting.)

13. Backfill soil to support roots in a horizontal position in the hole.

    FIGURE 1



JOB SHEET #2

14. Apply water to remove air pockets and let soil settle.

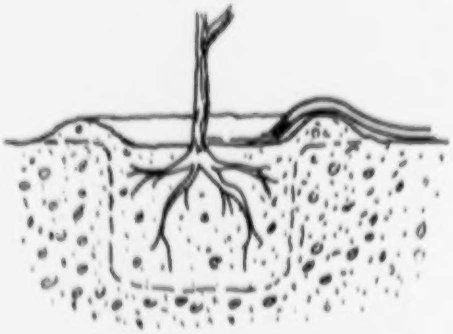
15. Continue to add backfill dirt and water to settle dirt and remove air pockets.

16. Level soil to surrounding surface contour.

17. Mold a neat saucer or basin of soil around the plant with a 4" to 6" ridge to serve as a water reservoir.

18. Fill basin with water.

FIGURE 2



19. Remove any labels which restrict future growth.

Steps 20 thru 25 are not required in every planting job. Your instructor will select those required to complete this job.

20. Evenly apply a fertilizer on soil surface keeping one foot from trunk or stem.

21. Spread a 4" layer of mulch around plant.

22. Replace sod up to the outside basin walls.

23. Prune to remove damaged limbs and to establish plant structure.

24. Apply tree wrap beginning at the base, wrapping upward, overlapping strips slightly to the first set of branches.

25. Stake plant.

(NOTE: Stakes may be added during or after planting.)

26. Clean area and discard all tags, wrappings, and excess soil.

27. Clean and return tools and materials to correct areas.

PLANTING AND MAINTAINING PLANT BEDS
UNIT V

JOB SHEET #3 — PLANT A CONTAINER GROWN PLANT

A. Tools and materials

1. Container grown plant
2. Spades
3. Shovels
4. Hoes
5. Pick
6. Wheelbarrow or piece of tarp or plastic sheeting
7. Forks
8. Scoops
9. Measuring device (tape, yardstick)
10. Watering hose
11. Can cutter or tin snips
12. Knife
13. Fertilizer if needed
14. Mulching material if needed
15. Pruning tools if needed

B. Procedure

1. Move selected plant from holding area to the job site.
2. Water if plant is wilted or dry.
3. Remove sod and weeds from site.
4. Moisten and cover sod if it is to be replaced around finished plantings.
5. Measure root size with a tape or tool handle.

JOB SHEET #3

6. Dig a flat-bottomed, straight-sided hole large enough to accommodate the root mass and allow backfilled soil to be added.

   (NOTE: Loosen glazed sides of hole if necessary.)

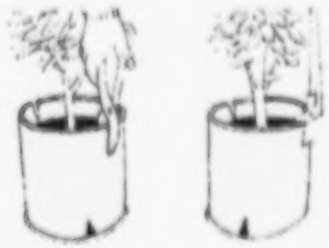
7. Place dirt removed from hole in a wheelbarrow or on a piece of tarp or plastic sheeting.

8. Condition or texturize soil removed from the hole by adding amendments, breaking up clods, and mixing well.

9. Remove plant from the container by these methods.

   a. Cut metal can from top to bottom on opposite sides using tin snips or can cutter.

      FIGURE 1



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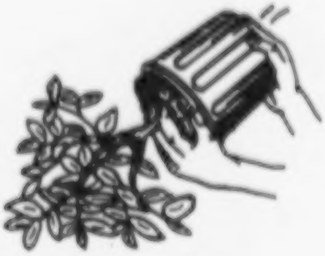
   b. Invert peat, plastic, or clay container tapping the bottom or rim edge to loosen the root mass.

      FIGURE 2



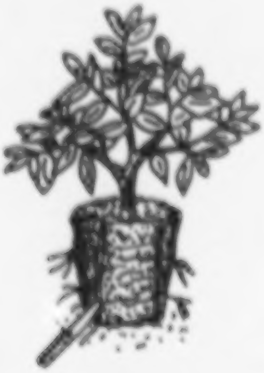
(CAUTION: The stem or crown may be pulled gently but cautiously.)

JOB SHEET #3

10. Pull circling roots free from the mass.

11. Cut dense, tangled roots 1" deep the full length of the root mass on opposite sides of the root mass.

FIGURE 3



12. Place plant in the hole with the crown level even with the surrounding soil surface or at the same depth as previously grown.

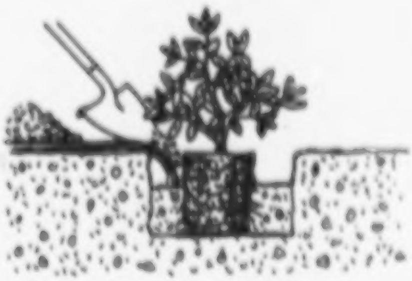
13. Straighten plant in hole viewing it from all sides.

14. Backfill a 5" to 6" layer of soil evenly around root mass.

15. Apply water to settle soil and remove air pockets.

16. Continue to add backfill dirt and water.

FIGURE 4



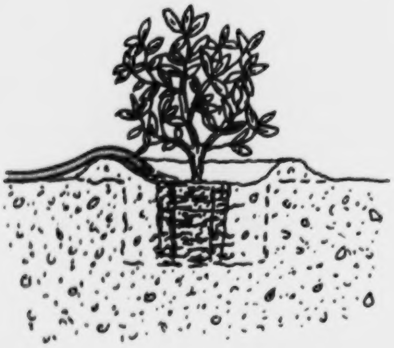
17. Level soil to surrounding surface contours.

18. Mold a neat basin of soil around the plant with a 4" to 6" outer ridge to serve as a water reservoir.

JOB SHEET #3

19. Fill basin with water.

FIGURE 5



20. Remove any labels which might restrain growth.

Steps 21 through 24 are not required in every planting job. Your instructor will select those required to complete this job.

21. Evenly apply a fertilizer on soil surface keeping material 1 foot from crown and avoiding contact with foliage.

22. Spread a 4" layer of mulch around plant.

23. Replace sod up to the outside basin ridge.

24. Prune to remove damaged limbs and to establish plant structure.

25. Clean area and discard tags, containers, and excess soil.

26. Clean and return tools and materials to correct areas.

PLANTING AND MAINTAINING PLANT BEDS
UNIT V

JOB SHEET #4 — PLANT BEDDING PLANTS

A. Tools and materials

1. Bedding plants
2. Spades
3. Shovels
4. Hoes
5. Wheelbarrow
6. Forks
7. Pruning tools
8. Measuring device
9. Hand trowel
10. Rakes
11. Watering hoses
12. Can splitter
13. Knife
14. Rotary tiller
15. Soil amendments if needed
16. Irrigation system equipment if needed
17. Slow-release fertilizer if needed
18. Pre-emergent herbicide if needed
19. Mulching material

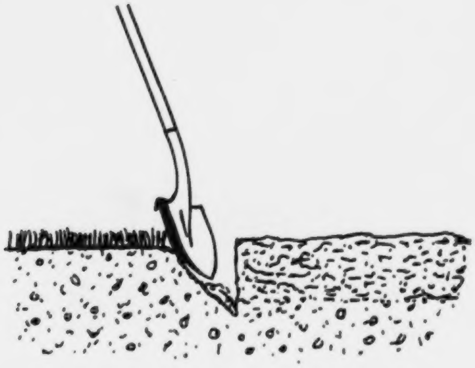
JOB SHEET #4

B. Procedure

1. Move selected plants from holding area to the job site.
2. Water plants well prior to transplanting.
3. Remove sod and weeds from site.
4. Cultivate bed area by hand digging small areas or rototilling large areas.

   (NOTE: Very dry soil should be watered, then worked later.)
5. Break up clods and rake out weed and grass pieces.
6. Add soil amendments if needed in a 4" to 6" layer and mix well with soil.
7. Install irrigation system if applicable.
8. Mark edge of proposed bed by stretching a line 1" above ground around edge.
9. Spade a 6" to 8" wedge of sod and soil around edge, beveling the ditch outward if edging materials are not used around bed.

FIGURE 1

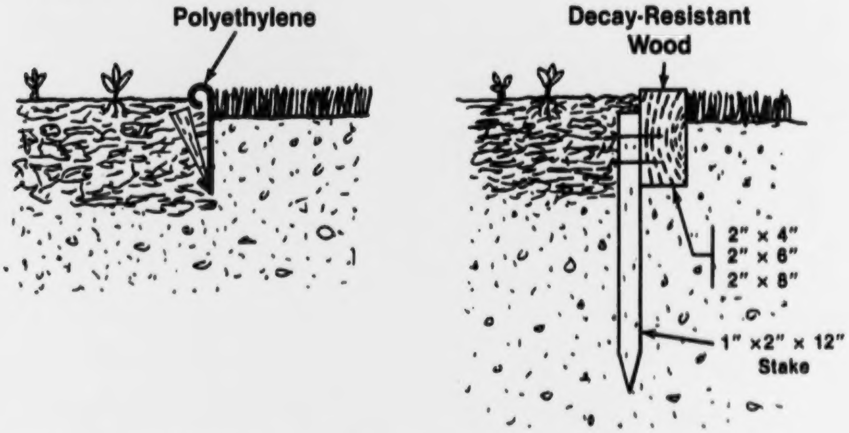


JOB SHEET #4

10. Install edging materials, anchoring securely with rods or stakes. Edging should be slightly higher than ground level.

    (NOTE: Cut sharply and vertically to accommodate edging materials.)

    FIGURE 2



11. Rake soil establishing final slope for drainage and plant display.

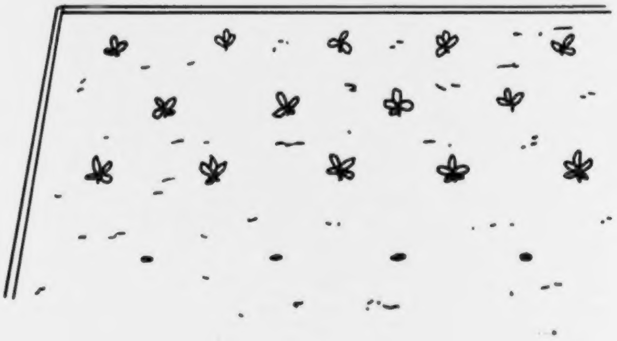
    a. Beds against structures should slope away from structure.

    b. Isolated beds should have soil highest in the center.

12. Mark planting pattern as shown in Figure 3 using offsetting lines.

    (NOTE: Spacing of bedding plants depends on plant species, rate of coverage desired, job budget, and design.)

    FIGURE 3

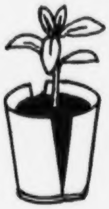


JOB SHEET #4

13. Remove plants from containers or small packs using the following methods.

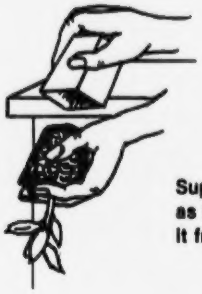
    a. Cut metal cans from top to bottom on opposite sides using tin snips or can cutter.

    FIGURE 4



    b. Invert nonmetal containers tapping the bottom or rim to loosen rootball.

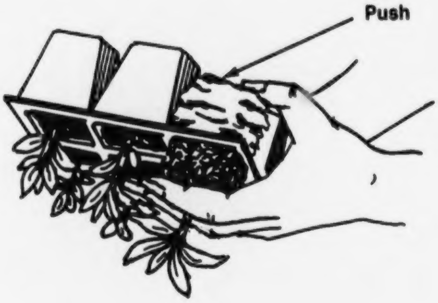
    FIGURE 5



Support rootball as you remove it from pot.

    c. Push up the soft plastic bottom of cell packs. Do not pull plants out by stem.

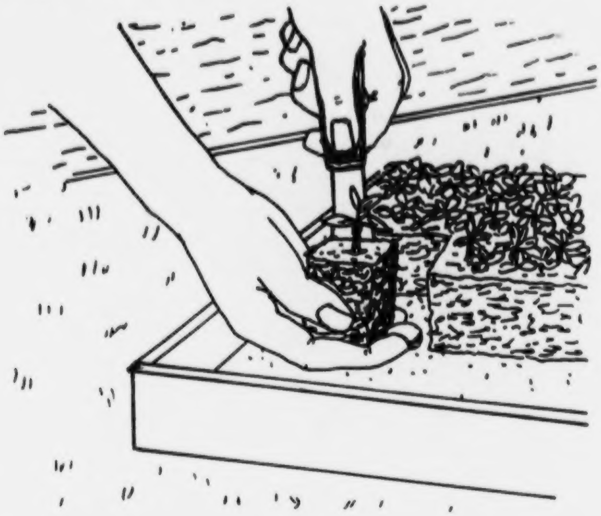
    FIGURE 6



JOB SHEET #4

d. Lift out plants sown directly into a flat by hand, gently pulling plants out and keeping roots intact.

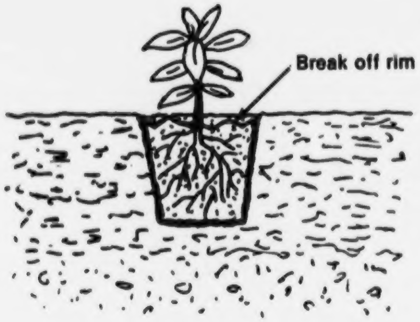
FIGURE 7



e. Peat pots may be left around roots if the "shoulders" or top rim is broken off or buried to prevent the wick-drying effect causing water to be drawn away from the roots.

(NOTE: Peat pots may not decompose quickly enough in dry regions and will have to be removed before planting.)

FIGURE 8



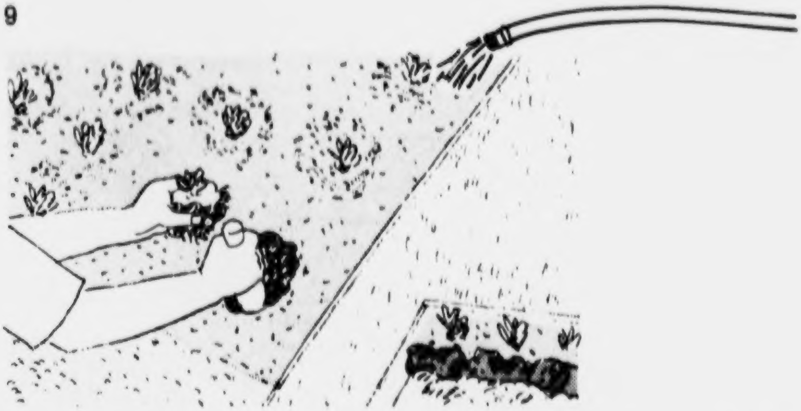
JOB SHEET #4

14. Loosen tight root mass.

15. Shorten extremely long roots.

16. Dig hole 2 times larger than rootball.

FIGURE 9



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17. Place roots in hole holding crown at surface level.

18. Firm soil around roots.

19. Brush any soil from crown and foliage.

20. Water in individual plants as they are planted instead of waiting until the entire bed is completed.

    (NOTE: A starter solution of a soluble fertilizer may be applied at this time.)

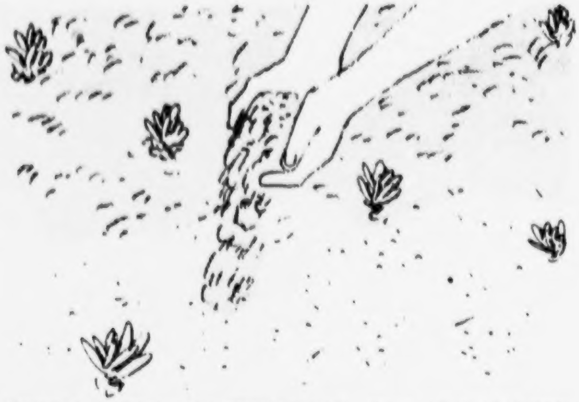
21. Apply a slow-release fertilizer evenly on soil surface avoiding contact with crown and foliage.

22. Apply a pre-emergent herbicide for weed control.

JOB SHEET #4

23. Spread a 2" layer of mulch around plants and over bed surface.

FIGURE 10



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24. Prune leggy plants or pinch back plants to promote a more compact growth habit if needed.

25. Redefine edges of bed.

26. Water entire bed.

27. Clean area and discard tags, containers, and excess soil.

28. Clean and return tools and materials to correct areas.

PLANTING AND MAINTAINING PLANT BEDS
UNIT V

PRACTICAL TEST
JOB SHEET #1 — PLANT A BALLED AND BURLAPPED TREE OR SHRUB

STUDENT'S NAME ______________________________ DATE ____________

EVALUATOR'S NAME ____________________________ ATTEMPT NO. ______

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:		YES	NO
1.	Checked out proper tools and materials.	______	______
2.	Kept plants watered or moist before planting.	______	______
3.	Carried plants properly.	______	______
4.	Dug hole correctly.	______	______
5.	Added soil texturizers and amendments.	______	______
6.	Removed wrappings on containers correctly.	______	______
7.	Loosened rootball if compacted.	______	______
8.	Placed plant in hole at proper depth.	______	______
9.	Backfilled soil evenly.	______	______
10.	Firmed soil around roots.	______	______
11.	Watered in plant material.	______	______
12.	Cleaned the work area, tools, and materials.	______	______
13.	Checked in/put away tools and materials.	______	______
14.	Used proper tools correctly.	______	______
15.	Performed steps in a timely manner. (___hrs. ___min. ___sec.)	______	______
16.	Practiced safety rules throughout procedure.	______	______

EVALUATOR'S COMMENTS: ____

____

JOB SHEET #1 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:				
Plant is at correct depth	4	3	2	1
Plant is straight	4	3	2	1
Plant is properly staked if needed	4	3	2	1
Planting site is clean and neat	4	3	2	1
Backfill is properly settled	4	3	2	1

EVALUATOR'S COMMENTS: ______________________________

____

PERFORMANCE EVALUATION KEY

4 — Skilled — Can perform job with no additional training.
3 — Moderately skilled — Has performed job during training program; limited additional training may be required.
2 — Limited skill — Has performed job during training program; additional training is required to develop skill.
1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

PLANTING AND MAINTAINING PLANT BEDS
UNIT V

PRACTICAL TEST
JOB SHEET #2 — PLANT A BAREROOT PLANT

STUDENT'S NAME ____________________ DATE __________

EVALUATOR'S NAME ____________________ ATTEMPT NO. ______

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper tools and materials.	______	______
2. Kept plants watered or moist before planting.	______	______
3. Carried plants properly.	______	______
4. Dug hole correctly.	______	______
5. Added soil texturizers and amendments.	______	______
6. Removed wrappings on containers correctly.	______	______
7. Loosened rootball if compacted.	______	______
8. Placed plant in hole at proper depth.	______	______
9. Backfilled soil evenly.	______	______
10. Firmed soil around roots.	______	______
11. Watered in plant material.	______	______
12. Cleaned the work area, tools, and materials.	______	______
13. Checked in/put away tools and materials.	______	______
14. Used proper tools correctly.	______	______
15. Performed steps in a timely manner. (___hrs. ___min. ___sec.)	______	______
16. Practiced safety rules throughout procedure.	______	______

EVALUATOR'S COMMENTS: ____

____

JOB SHEET #2 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:				
Plant is at correct depth	4	3	2	1
Plant is straight	4	3	2	1
Plant is properly staked if needed	4	3	2	1
Planting site is clean and neat	4	3	2	1
Backfill is properly settled	4	3	2	1

EVALUATOR'S COMMENTS: ______________________________________

____

PERFORMANCE EVALUATION KEY

4 — Skilled — Can perform job with no additional training.
3 — Moderately skilled — Has performed job during training program; limited additional training may be required.
2 — Limited skill — Has performed job during training program; additional training is required to develop skill.
1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

PLANTING AND MAINTAINING PLANT BEDS
UNIT V

PRACTICAL TEST
JOB SHEET #3 — PLANT A CONTAINER GROWN PLANT

STUDENT'S NAME ______________________________ DATE ____________

EVALUATOR'S NAME ____________________________ ATTEMPT NO. ______

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper tools and materials.	______	______
2. Kept plants watered or moist before planting.	______	______
3. Carried plants properly.	______	______
4. Dug hole correctly.	______	______
5. Added soil texturizers and amendments.	______	______
6. Removed wrappings on containers correctly.	______	______
7. Loosened rootball if compacted.	______	______
8. Placed plant in hole at proper depth.	______	______
9. Backfilled soil evenly.	______	______
10. Firmed soil around roots.	______	______
11. Watered in plant material.	______	______
12. Cleaned the work area, tools, and materials.	______	______
13. Checked in/put away tools and materials.	______	______
14. Used proper tools correctly.	______	______
15. Performed steps in a timely manner. (___hrs. ___min. ___sec.)	______	______
16. Practiced safety rules throughout procedure.	______	______

EVALUATOR'S COMMENTS: ____

____

JOB SHEET #3 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:				
Plant is at correct depth	4	3	2	1
Plant is straight	4	3	2	1
Plant is properly staked if needed	4	3	2	1
Planting site is clean and neat	4	3	2	1
Backfill is properly settled	4	3	2	1

EVALUATOR'S COMMENTS: ____

____

PERFORMANCE EVALUATION KEY

4 — Skilled — Can perform job with no additional training.
3 — Moderately skilled — Has performed job during training program; limited additional training may be required.
2 — Limited skill — Has performed job during training program; additional training is required to develop skill.
1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

PLANTING AND MAINTAINING PLANT BEDS
UNIT V

PRACTICAL TEST
JOB SHEET #4 — PLANT BEDDING PLANTS

STUDENT'S NAME ______________________________ DATE ____________

EVALUATOR'S NAME ____________________________ ATTEMPT NO. ______

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper tools and materials.	______	______
2. Kept plants watered or moist before planting.	______	______
3. Carried plants properly.	______	______
4. Dug hole correctly.	______	______
5. Added soil texturizers and amendments.	______	______
6. Removed wrappings on containers correctly.	______	______
7. Loosened rootball if compacted.	______	______
8. Placed plant in hole at proper depth.	______	______
9. Backfilled soil evenly.	______	______
10. Firmed soil around roots.	______	______
11. Watered in plant material.	______	______
12. Cleaned the work area, tools, and materials.	______	______
13. Checked in/put away tools and materials.	______	______
14. Used proper tools correctly.	______	______
15. Performed steps in a timely manner. (___hrs. ___min. ___sec.)	______	______
16. Practiced safety rules throughout procedure.	______	______

EVALUATOR'S COMMENTS: ____

____

JOB SHEET #4 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:

Plant is at correct depth	4	3	2	1
Bed has correct slope	4	3	2	1
Planting pattern is staggered	4	3	2	1
Planting site is clean and neat	4	3	2	1
Plants are adequately watered	4	3	2	1
Edging is straight and correct height	4	3	2	1

EVALUATOR'S COMMENTS: ______________________________

____

PERFORMANCE EVALUATION KEY

4 — Skilled — Can perform job with no additional training.
3 — Moderately skilled — Has performed job during training program; limited additional training may be required.
2 — Limited skill — Has performed job during training program; additional training is required to develop skill.
1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

PLANTING AND MAINTAINING PLANT BEDS
UNIT V

TEST

NAME ____ SCORE ________________

1. Match the terms on the right with the correct definitions.

_____a. Acclimating plants to environmental conditions

_____b. The portion of a plant at the junction of the root and stem or trunk

_____c. Temporary storage of plant materials in a shallow ditch or trench with moisture-conserving materials or soil covering the root system

_____d. Stems growing horizontally on or below the soil surface forming leaves and roots at the nodes

_____e. Alternate freezing and thawing of the soil which can force small plant materials out of the ground

_____f. A dilute fertilizer solution applied following transplanting to provide water and quickly-available nutrients

_____g. Border which helps to retain plants within an area and retard unwanted plants from spreading into it

_____h. Detached vegetative plant parts which have the ability to develop roots and shoots forming a new plant

_____i. Chemical or mineral element added to the soil to improve soil characteristics

_____j. Any loose, dry material such as straw, leaves, peat, etc. used as a thin protective covering over the soil

_____k. Not actively growing, but capable of resuming growth when environmental conditions become favorable

1. Crown
2. Cuttings
3. Dormant
4. Drip line
5. Edging
6. Foliage
7. Hardening off
8. Heaving
9. Heeling in
10. Mulch
11. Peat pellets
12. Rhizomes
13. Shingle-tow
14. Soil amendment
15. Starter solution
16. Stolons

TEST

2. Match the classes of plants according to their growth habits which are listed on the right with the correct definitions.

_____a. Plants having more or less soft or succulent tissue

_____b. Plants that complete their life cycle in two years; produce leaves the first year; flowers, fruit, and seeds the second year; and then die

_____c. Plants that retain most of their foliage throughout the year

_____d. Plants that complete their life cycle in one growing season

_____e. Plants that loose their foliage at the end of the growing season

_____f. Plants having a protective outer layer of bark and inner layer of annual growth rings; persist above ground from year to year in zones where they are hardy

1. Annuals
2. Biennials
3. Deciduous
4. Evergreen
5. Herbaceous plants
6. Perennials
7. Woody plants

3. Match classes of plants according to landscape form and use listed on the right with the correct descriptions.

_____a. Low growing, spreading plants used to cover areas, exclude undesirable plants, or prevent erosion

_____b. Woody, perennial plants usually having multiple stems and usually smaller than a tree

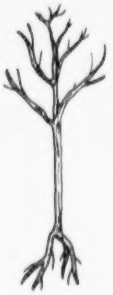
_____c. Woody, perennial plants usually having a single main axis or stem and usually exceeding ten feet in height at maturity

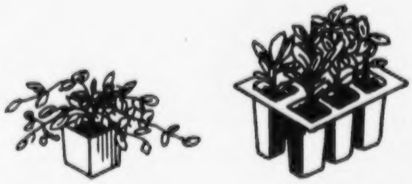
_____d. Plants preplanted and growing in small packets for transplanting in groups to cover a prescribed area; used for their showy flowers or foliage

1. Trees
2. Shrubs
3. Vines
4. Ground covers
5. Bedding plants

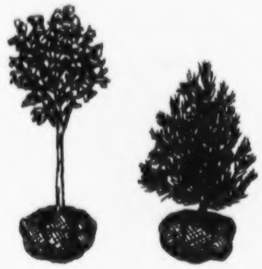
TEST

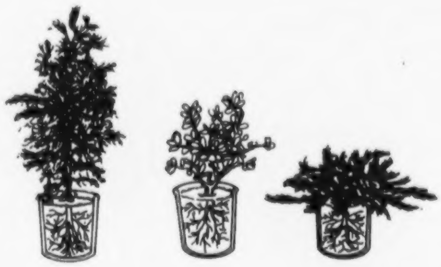
4. Identify the following classes of plants according to their root forms.





a. ______________________ b. ______________________





c. ______________________ d. ______________________

5. Distinguish between the various root forms by placing the following letters next to the correct characteristics.

- B&B — Balled and burlapped
- BR — Bareroot
- C — Container grown
- SP — Small package

_____a. Can be maintained for long periods but may become rootbound

_____b. Very expensive

_____c. Relatively inexpensive; plants may be sent mail order

_____d. Outside may be peat or plastic pots, cell packs, peat pellets, clay pots

_____e. Plants are seeded, rooted, and grown in same container with roots intact

_____f. May require larger equipment for harvesting, transporting, and planting because plants are heavy

TEST

6. Answer the following questions on procedures for handling various plant materials.

   a. What should you inspect for on bareroot plant materials when they arrive?

   b. After inspection, what should you check for and replace on container grown plant materials if needed?

   c. How should you protect bareroot and balled and burlapped plant materials from adverse conditions?

   d. Which types of plant materials dry out faster? (Circle the two correct answers) Heeled in balled and burlapped, heeled in bareroot, containers, small packs

   e. How should balled and burlapped plants be lifted?

7. Answer the following questions on techniques for planting/transplanting plant materials in your region.

   a. What is the best time in your region to transplant a balled and burlapped tree?

   b. What is the best time in your region to transplant a bareroot tree?

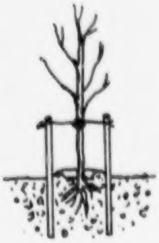
   c. Concerning planting depth, at what level should the crown of the plant be in relationship to the surrounding surface?

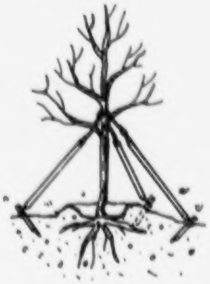
   d. How large should the planting hole be?

   e. What policy should you follow about fertilizing and staking newly planted plants? (This may have been set by your instructor. If not, what policy would be appropriate?)

TEST

8. Identify the following methods for staking plant materials.





a. ______________________________ b. ______________________________

9. Complete the following rules for staking by filling in the blanks.

   a. Remove staking materials as soon as ________________ become established.

   b. Wrap wires or place through sections of ____________ .

   c. Stakes driven close to plants should not touch ____________ .

   d. Check all wires and stakes after ____________ weather conditions.

10. Select true statements on trimming and grooming practices by placing an "X" next to the true statements.

    _____a. Bring large evergreen and deciduous plants into bounds by removing longer branch tips allowing the shorter branches to set the form.

    _____b. Soft new growth on hedges should not be cut.

    _____c. Cut suckers at a height of 2 feet above the ground.

    _____d. Old canes should never be removed.

    _____e. Remove dead, damaged, or diseased limbs. Cut limbs to a bud or branching "Y". Do not leave a stub.

    _____f. Do not remove dead flowers and foliage. These should be left on the plants.

    _____g. Collect all trash and plant debris.

    _____h. Rake and smooth mulch and soil surfaces.

    _____i. Hoe weeds and unwanted grass.

TEST

11. List five requirements for a good mulch.

    a. ____________________
    b. ____________________
    c. ____________________
    d. ____________________
    e. ____________________

12. List seven types of mulches and two outstanding characteristics of each.

    a. Type of mulch ____________________
        1) Characteristic ____________________
        2) Characteristic ____________________

    (NOTE: Use the same format for your other six mulches and their characteristics.)

    b. ____________________
        1) ____________________
        2) ____________________
    c. ____________________
        1) ____________________
        2) ____________________
    d. ____________________
        1) ____________________
        2) ____________________
    e. ____________________
        1) ____________________
        2) ____________________
    f. ____________________
        1) ____________________
        2) ____________________
    g. ____________________
        1) ____________________
        2) ____________________

TEST

13. List two reasons for replacing mulch materials.

    a. ______________________________

    b. ______________________________

14. List two reasons for replacing plant materials.

    a. ______________________________

    b. ______________________________

(NOTE: If the following activities have not been accomplished prior to the test, ask your instructor when they should be completed.)

15. Demonstrate the ability to

    a. Plant a balled and burlapped tree or shrub. (Job Sheet #1)

    b. Plant a bareroot plant. (Job Sheet #2)

    c. Plant a container grown plant. (Job Sheet #3)

    d. Plant bedding plants. (Job Sheet #4)

PLANTING AND MAINTAINING PLANT BEDS
UNIT V

ANSWERS TO TEST

1. a. 7
   b. 1
   c. 9
   d. 16
   e. 8
   f. 15
   g. 5
   h. 2
   i. 14
   j. 10
   k. 3

2. a. 5
   b. 2
   c. 4
   d. 1
   e. 3
   f. 7

3. a. 4
   b. 2
   c. 1
   d. 5

4. a. Bareroot
   b. Small packet or packaged materials
   c. Balled and burlapped
   d. Container grown

5. a. C
   b. B&B
   c. BR
   d. SP
   e. SP
   f. B&B

6. a. Damaged roots, diseased plants
   b. Damaged, unusable pots, washed out growing media, missing identification tags
   c. Heel in or mulch
   d. Containers, small packs
   e. By the rootball or rope bindings

7. Evaluated to the satisfaction of the instructor

8. a. Two-stake
   b. Three-stake

9. a. Roots
   b. Garden hose
   c. Stems or trunks
   d. Wet or windy

ANSWERS TO TEST

10. a, e, g, h, i

11. Any five of the following:

    a. Holds moisture
    b. Is attractive
    c. Controls weeds
    d. Controls erosion
    e. Prevents rapid temperature fluctuations
    f. Does not compact easily
    g. Does not wash or blow away
    h. Does not tie up nutrients
    i. Is not a fire hazard
    j. Should not encourage disease development

12. Any seven types and any two characteristics for each of the seven:

TYPES	CHARACTERISTICS
a. Peat	Not a mowing hazard, attractive, various grades, once wet, retains water well, fibrous or powdery, hard to wet, deteriorates, scatters in the wind, expensive for large areas.
b. Bark	Not a mowing hazard, attractive but turns gray with exposure, various sizes, fire hazard if very dry, washes away, needs to be replaced every 1 to 2 years.
c. Manure bedding	Variable expense, available, strong odor initially, contains weed seeds, straw, or wood shavings, must be decomposed before use, molds, may pack down.
d. Pecan shells, almond hulls	Attractive, uniform, extremely durable, limited availability, expensive.
e. Ground corn cobs	Molds, limited availability, turns gray, controls weeds.
f. Sawdust, wood shavings	Decomposes slowly, not uniform — contains chips, splinters, packs down, may attract insects, low in plant nutrients.
g. Pine needles	Attractive, durable, limited availability, will not pack.

ANSWERS TO TEST

	TYPES	CHARACTERISTICS
h.	Peanut hulls, cottonseed hulls	Durable, packs down, attractive to rodents, molds, retains too much water in a rainy season. May carry verticillium wilt which affects some plants.
i.	Tree leaves, lawn clippings	Excellent humus, packs down, easily available, may contain herbicides, scatters, washes, decomposes rapidly.
j.	Hay, straw	Inexpensive, easily available, controls erosion, limited life, replace often, packs, unattractive, scatters, flammable.
k.	Crushed stone, marble chips, brick chips, river rock	Durable, attractive, mowing hazard, heavy, light colors discolor, nonflammable, limited use, crushed stone adds calcium.
l.	Shredded tires	Durable, limited availability, unattractive, flammable.
m.	Plastic	Inexpensive, black retards weed growth, heat buildup, sheds water, deteriorates, slippery.
n.	Fiber mats	Limited weed control — quack grass will grow through mat and seeds will germinate on mats, commonly used under other mulches, allows water and air penetration, expensive, deteriorates if exposed to sunlight.

13. Any two of the following:

    a. Decomposed
    b. Washed away
    c. Weed seeds germinate
    d. Decline in appearance

14. Any two of the following:

    a. Plants are dead or damaged.
    b. Plants are overgrown or unattractive.
    c. Plants are leggy or too open in the centers and cannot be rejuvenated.
    d. Perennials, especially flowering plants, multiply and need to be divided.

15. Performance skills evaluated to the satisfaction of the instructor

ESTABLISHING AND MAINTAINING TURF
UNIT VI

UNIT OBJECTIVE

After completion of this unit, the student should be able to establish and maintain turf areas using various methods. Competencies will be demonstrated by completing the assignment sheet, job sheets, and the unit tests with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to establishing and maintaining turf with the correct definitions.
2. Distinguish between the two types of turfgrasses.
3. Classify methods of turf establishment.
4. Select considerations for establishing turf by seeding.
5. Distinguish between techniques which may be used when establishing a turf.
6. Select true statements concerning turfgrass care after establishment.
7. Complete statements concerning guidelines for mowing established turf.
8. Distinguish between advantages and disadvantages of clippings.
9. List causes of thatch.
10. Select from a list the damage caused by thatch buildup.

OBJECTIVE SHEET

11. Distinguish between the methods of cultivating compacted soils.
12. Select true statements concerning turfgrass fertilization.
13. Select from a list the factors affecting fertilizer application.
14. List causes and ways to prevent weed problems.
15. List symptoms and ways to prevent disease problems.
16. List symptoms and ways to prevent insect problems.
17. List symptoms and ways to prevent nematode problems.
18. List symptoms and ways to control animal pest problems.
19. Calculate lawn areas. (Assignment Sheet #1)
20. Demonstrate the ability to:
    a. Prepare a turf planting site. (Job Sheet #1)
    b. Plant a prepared site by seeding. (Job Sheet #2)
    c. Plant a prepared site by sodding. (Job Sheet #3)
    d. Plant a prepared site by sprigging. (Job Sheet #4)
    e. Plant a prepared site by plugging. (Job Sheet #5)
    f. Plant a prepared site by stolonizing. (Job Sheet #6)
    g. Winter overseed an existing lawn. (Job Sheet #7)
    h. Remove thatch from an established lawn.(Job Sheet #8)

ESTABLISHING AND MAINTAINING TURF
UNIT VI

SUGGESTED ACTIVITIES

A. Obtain additional materials and/or invite resource people to class to supplement/reinforce information provided in this unit of instruction.

(NOTE: This activity should be completed prior to the teaching of this unit.)

B. Provide students with objective sheet.

C. Discuss unit and specific objectives.

D. Provide students with information and assignment sheets.

E. Discuss information and assignment sheets.

F. Provide students with job sheets.

G. Discuss and demonstrate the procedures outlined in the job sheets.

H. Integrate the following activities throughout the teaching of this unit:

1. Take a soil test.

2. Discuss area soil testing facilities and procedures for obtaining a soil analysis.

3. Take a field trip to see the most popular turfgrasses growing in the area. Discuss the characteristics that make them popular in your area.

4. Discuss common water and fertilization practices in the area.

5. Demonstrate and discuss power equipment used in planting, dethatching, and renovating turfgrasses.

   Examples: Power rakes, vertical mowers, seeders

6. Review Unit II, "Hand Tools" and Unit III, "Light Power Equipment" for safe operation procedures and equipment clean up.

7. Demonstrate the operation of different types of edgers.

8. Demonstrate the operation of different types of mowers.

9. Demonstrate or discuss mowing techniques.

10. Discuss subsurface drains and irrigation systems that may be necessary in areas where students will install turfgrass.

SUGGESTED ACTIVITIES

11. Calibrate a gravity spreader for uniform seed distribution on a new seed bed.

12. Discuss maintenance of an overseeded winter lawn.

13. Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas for improvement.

I. Give test.

J. Evaluate test.

K. Reteach if necessary.

RESOURCES USED IN DEVELOPING THIS UNIT

A. *Greenskeeping*. Instructional Materials Services, College of Agriculture. University Park, PA: Pennsylvania State University, 1981.

B. Beard, James B. *How to Have a Beautiful Lawn*. College Station, TX: Beard Books, 1983.

C. Giles, Floyd. *Landscape Construction Procedures, Techniques, and Design*. Champaign, IL: Stipes Publishing Co., 1986.

D. Rice, Laura Williams and Robert P. Rice, Jr. *Practical Horticulture: A Guide to Growing Indoor and Outdoor Plants*. Englewood Cliffs, NJ: Prentice-Hall, 1986.

E. Turgeon, A.J. *Turfgrass Management*, revised edition. Reston, VA: Reston Publishing Co., Inc., 1985.

F. Denisen, Erwin L. *Principles of Horticulture*. New York: Macmillan Publishing Co., Inc., 1979.

G. Daniel, W. H. and R. P. Freeborg. *Turf Manager's Handbook*. Cleveland, OH: Harvest Publishing Co., 1979.

H. Sprague, Howard B. *Turf Management Handbook*. Danville, IL: Interstate Printers and Publishers, Inc., 1982.

SUGGESTED SUPPLEMENTAL RESOURCES

A. Lassanske, Daniel E. *Nursery Teacher's Survival Guide*. San Luis Obispo, CA: Vocational Education Productions, California Polytechnic State University, 1982.

B. Peltier, Ruth A. *Mathematics for Horticulture*. Columbus, OH: Ohio Agriculture Education Curriculum Materials Service, Ohio State University, 1982.

C. *Agricultural Chemical Label Book*, sixth edition. Goddard, KS: Pueblo Chemical & Supply Co., 1982.

D. *Farm Chemicals Handbook*. (Annually updated.) Willoughby, OH: Meister Publishing Co.

E. *Herbicide Handbook*, fifth edition. Champaign, IL: Weed Science Society of America, 1983.

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G. *Scotts Guide to the Identification of Grasses*. Marysville, OH: O.M. Scott & Sons Co. Scotts Proturf Division, Department - D.I., 1979.

H. *Weed Control Manual*. (Annually updated.) Willoughby, OH: Ag Consultant and Fieldman.

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J. *Weeds of the North Central States*. Bulletin 772. Champaign, IL: University of Illinois at Urbana, 1981.

JOURNALS AND MAGAZINES

A. *Professional Books for Professional People*
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B. *Technical, Management, Design Books*
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ESTABLISHING AND MAINTAINING TURF
UNIT VI

INFORMATION SHEET

I. **Terms and definitions**

A. Asexual propagation — The duplication of a whole plant by methods other than seeding

Examples: Stem tip cutting, crown division

B. Crown — The transition area from trunk or shoots to roots

C. Fumigant — Chemical in a volatile gas form which kills nematodes, weeds, seeds, and other pests in a confined area

D. Lesions — An area of dead tissue

E. Nematodes — Microscopic roundworms that are found in plants, soil, and animals

F. Overseeding, winter — Seeding a cool season turfgrass over a warm season grass to maintain green turf while the warm season lawn is dormant

G. Plug — A piece of sod used to establish or repair an existing turf area

H. Reestablishment — Method of lawn management which requires complete removal of existing turf, basic site preparation, and replanting with new seed or sod

I. Renovation — Restoring turfgrass through overseeding or vegetative planting in an existing lawn without complete clearing and reworking of the soil

J. Rhizome — Stem that grows horizontally partly or completely under the soil surface

K. Sexual propagation — Reproducing plants by seed

L. Sod — Top few inches of soil and established turf

M. Sprig — Piece of grass stolon or rhizome

N. Stolon — An elongated stem or shoot that grows along the soil surface with leaves and roots developing at the nodes

O. Thatch — Buildup of old clippings, roots, and stems in growing turf

P. Weeds — Plants growing where they are not wanted

INFORMATION SHEET

II. **Types of turfgrasses**

A. Warm season — Grasses with an optimum growth temperature of 80° to 95° F (26.7°C - 35.5°C). These species are usually dormant below 60°F (15.6°C).

Examples: Bermudagrass, St. Augustinegrass, bahiagrass, zoysiagrass, centipedegrass, buffalograss, carpetgrass

B. Cool season — Grasses with an optimum growth temperature of 60° to 75° F (15.6°C to 23.8°C).

Examples: Kentucky bluegrass, rough bluegrass, chewing fescue, hard fescue, tall fescue, perennial ryegrass, Italian ryegrass, colonial bentgrass, creeping bentgrass, velvet bentgrass

III. **Methods of turf establishment** (Job Sheets #2-#6)

A. Sexual propagation

1. Seeding — Spreading dry seed on a prepared soil surface

   Examples: Some bermudagrass, buffalograss, Kentucky bluegrass, tall fescue, fine fescue

2. Hydroseeding — Applying a water, seed, and pulp fiber mulch combination under pressure to a prepared soil surface. This method is frequently used on slopes, roadsides, and rocky areas.

B. Asexual propagation — Turf areas established by this method should be established at least two months before frost for good root development.

Examples: Bermudagrass, centipedegrass, St. Augustinegrass

1. Sodding — Strips of turfgrass with adhering soil are usually laid on the soil to form a solid, "instant" turf cover.

2. Plugging — Two-inch pieces (plugs) of turfgrass with adhering soil are planted into the soil spaced 6 to 18 inches apart. This method allows growth of a solid turf cover after one growing season.

   Examples: Zoysia, bermudagrass, creeping bentgrass

3. Sprigging — Turf material with leaves, stolons, and rhizomes which are planted in rows or individual holes. Generally, one to four bushels of sprigs are used to plant 1000 sq. ft.

4. Stolonize — Stolons or rhizomes are broadcast or scattered uniformly over prepared soil, then topdressed and pressed into contact with the soil. Generally, five to ten bushels of material are used to cover 1000 sq. ft.

INFORMATION SHEET

IV. Considerations for establishing turf by seeding

A. Seeding rate (Handout #1)

1. Based on pure live seed.
2. Variable seeding rates; based on turfgrass species.
3. Excess seeding rates produce weak seedlings and slow sod formation.

B. Percent germination

Example: Of 10 lbs. of bermudagrass seed, 8 lbs. of seed sprouted or germinated. The percent (%) of germination is 80%.

C. Seed purity

1. Harvested seed may be mixed with crop or weed seeds and inert matter.
2. Good quality seed has a purity of 90 to 95%.

D. Seed mixtures

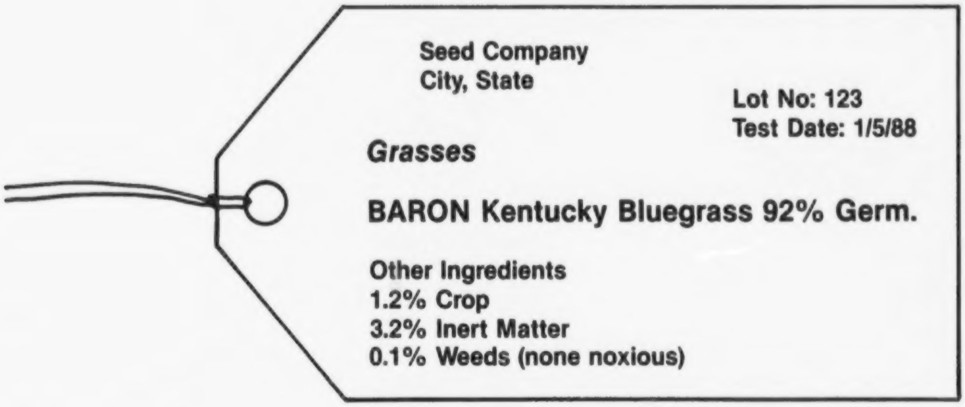
Examples: Mixing different cultivars of the same species, mixing different species

1. Enhance establishment over a variety of conditions.

   Examples: Site with full sun and full shade areas, site with drought areas and/or wet areas.

2. Should contain species or cultivars with similar color and texture.

   (NOTE: State and federal regulations control the minimum information on the seed label. It lists supplier, turf species or cultivar name, seed purity, germination percent, and test date.)



Seed Company
City, State

Lot No: 123
Test Date: 1/5/88

Grasses

BARON Kentucky Bluegrass 92% Germ.

Other Ingredients
1.2% Crop
3.2% Inert Matter
0.1% Weeds (none noxious)

INFORMATION SHEET

V. **Techniques which may be used when establishing a turf**

A. Topdressing

1. Involves applying a thin layer of compatible soil or sand on a new or established turf area

2. Used to fill depressions and to help control thatch, retard drying of plant materials, and protect plants from temperature stress

(NOTE: Topdressing can cause injury if layers are too thick and exclude sunlight.)

B. Mulching

1. Involves applying a thin protective covering of natural or manufactured mulching materials over the soil

2. Used to conserve moisture, protect against runoff and erosion, discourage weeds, and lessen temperature variations

(NOTE: Mulching can provide a favorable microclimate for seed germination and seedling establishment.)

3. Common mulching materials used when establishing grass include

a. Natural mulches such as straw, wood chips, peat, and compost

b. Manufactured mulches such as excelsior mat, jute net, burlap paper net, and pump fiber

(NOTE: These are used extensively for maintaining slopes.)

VI. **Turfgrass care after establishment**

A. Irrigate new plantings daily moistening the upper 2 inches of soil.

B. As turf becomes established, reduce irrigation frequency and increase irrigation depth to about 6 to 8 inches or as required by specific turf or regional climates.

(NOTE: Water when turf shows the first signs of wilt. This is characterized by a blue/gray appearance and "footprinting" which is when grass does not return to an upright position quickly but shows the footprints when walked upon.)

C. Apply water at a rate the soil can quickly absorb to prevent runoff.

D. Reapply fertilizer about 3 weeks after planting.

INFORMATION SHEET

E. Apply a recommended herbicide only when weed competition henders turfgrass coverage and danger of damage to seedlings has passed.

F. Mow turf as appropriate for the turf species, turf use, and season of the year.

VII. **Guidelines for mowing established turf**

A. Mowing heights (Handout #2)

1. Correct heights depend on the turf species, turf use, and season of the year.

   Example: Mowing cool season grasses higher during high temperatures will protect the crown.

2. Heights set too low seriously affect turf growth. The turf will have reduced root and shoot growth, less tolerance of environmental stress, and less wear resistance.

B. Mowing frequency

1. How often the turf needs mowing depends on climatic conditions, growth rate of turf species, and purpose of turf area.

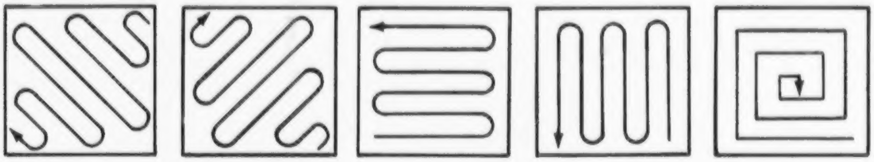
   Example: When temperature and rainfall conditions are ideal for the turf species, it will grow faster and require more frequent mowing.

2. Removing more than 1/3 of leaf area results in partial loss of the shoot or roots and eventually can destroy turf.

3. Too frequent mowing reduces turf growth and increases operating costs.

C. Mowing patterns

1. Some common mowing patterns are as follows:



2. Minimize turf wear and increase turf uniformity by alternating mowing directions or patterns each time you cut.

INFORMATION SHEET

D. Mowing techniques

1. Mow *across* steep slopes, not up and down.
2. Turn corners or directions slowly to prevent the mower's wheels from tearing the turf. Turn on a paved sidewalk or driveway when possible. However, do *not* turn on gravel surfaces.
3. Make sure the mower's cutting blade is sharp before using it.
4. Mow at a steady pace, slow enough to prevent clumpy, unevenly mowed turf.
5. Check to make sure grass is dry enough to be mowed. Wet grass clogs equipment, spreads diseases, cuts unevenly, slows mower, and compacts soil.
6. Overlap cutting passes by about 2 inches to prevent missed spots.

VIII. Advantages and disadvantages of clippings

A. Advantages of clippings

1. If mowed frequently so clippings are short, they will disappear into the lawn.
2. Short clippings decompose quickly so they do not contribute to the thatch layer.
3. Clippings are a source of plant nutrients, especially nitrogen.
4. Moisture is retained.

B. Disadvantages of clippings

1. If mowed infrequently so clippings are long, they will clump and distort turf growth.
2. Long clippings contribute to the thatch layer.
3. Clippings may contribute to disease occurrence.
4. On golf greens, clippings interfere with play.
5. In areas with low rainfall levels, clippings will not decompose.

INFORMATION SHEET

IX. **Causes of thatch**

A. Rapid turf growth producing stems and roots faster than the vegetation can decompose

B. Reduced microorganism, earthworm, and insect activity

C. Turf allowed to grow too tall, then cut severely (more than $\frac{1}{3}$ of top growth)

D. Long clippings left on turf

E. Disease

F. Planting of the more vigorous turfgrass cultivars

X. **Damage caused by thatch buildup**

A. Increased disease and insect damage

B. Unevenly mowed turf

C. Shallow root development

D. Slow air and water movement through turf

E. Dry spots in the turf

F. Growing shoots are shaded out.

XI. **Methods of cultivating compacted soils**

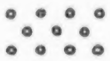
(NOTE: Compaction is usually caused by heavy traffic over an area and affects the upper 3 inches of soil.)

A. Coring — Removes plugs of soil leaving holes 3 to 4 inches deep.

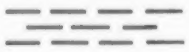
B. Forking — Hand working a small area with a tined fork by pushing the fork into the soil 6 to 8 inches deep and then rocking or working the fork back and forth loosening the soil. Repeated several times.

C. Slicing — Vertically cuts slits 3 to 4 inches long and 3 to 4 inches deep.

D. Spiking — Produces shallow holes $\frac{1}{2}$ inch long and $\frac{1}{2}$ to $\frac{3}{4}$ inch deep.


Coring

Forking


Slicing

Spiking

INFORMATION SHEET

XII. **Turfgrass fertilization**

   A. A soil test should be taken to determine the nutrient level and pH of the area before lawn installation and as recommended in your area after establishment.

   B. Soil amendment applications should be based on the soil test, existing turf condition, existing thatch, stress conditions, and presence of disease.

      Examples:
      Lime — Adjust pH
      Sulfur — Adjust pH
      Gypsum — Improve the soil conditions
      Nitrogen — Nutrient
      Phosphorus — Nutrient
      Potassium — Nutrient

   C. Nitrogen is needed in the largest amounts by turfgrass.

   D. Nitrogen application is based on the appearance of the turf, use of the area, desired greenness, and whether or not clippings are removed.

XIII. **Factors affecting fertilizer application**

   A. Form of fertilizer material

      1. Dry

      2. Liquid

         a. Nutrients can be specially mixed to serve a specific area.

         b. Pesticides can be mixed and applied with nutrients.

         c. Nutrients can be applied for foliar absorption.

         (CAUTION: Turf should be irrigated after fertilizer application to avoid foliar burn.)

   B. Equipment

      1. Drop spreader and rotary spreader

         a. Various sizes from push types to tractor pulled models.

         b. Mixes of different granular sizes of fertilizer are difficult to apply uniformly with rotary spreaders.

         c. Spreaders must be cleaned thoroughly after use.

INFORMATION SHEET

2. Sprayers and irrigation systems
    a. Liquid may be applied through existing irrigation lines, by injector systems, by hand sprayers, and hose end sprayers.
    b. Liquid applicators must be cleaned out completely.

C. Spreading patterns

1. Spread half of a dry granular fertilizer in one direction and half in another, usually at a right angle to the first.
2. Overlap the spreader wheel just inside the previous strip when using a drop spreader.
3. Overlap fertilizer pattern when using a rotary broadcast spreader.
4. Divide areas receiving liquid applications into units of 2 or 4. Apply ½ or ¼ of liquid mix to each area.

D. Timing

1. Turf should be fertilized as needed for the region, climatic conditions, turf conditions, and desired level of turf health.
2. High use areas such as athletic fields, golf fairways, etc. will require more frequent and specialized fertilizer schedules.

XIV. **Weed problems**

A. Causes of weed problems

1. Thinned turfgrass resulting from:
    a. Pest injury
    b. Soil compaction in high traffic areas
    c. Mowing too low
    d. Nutrient deficiency
    e. Drought or water logging
2. Spread of weed seeds by:
    a. Wind
    b. Contaminated (impure) top dressing and mulches

INFORMATION SHEET

c. Water

d. Equipment

e. Traffic

f. Birds and animals

B. Ways to prevent weed problems

1. Clean all equipment carefully before and after use.

2. Promote vigorous turf growth.

3. Use chemical and mechanical preplanting control.

4. Mow to reduce weed growth competition.

5. Apply chemicals for selective weed control after turf establishment.

XV. Disease problems

A. Symptoms of disease problems

(NOTE: Specific symptoms are associated with each disease and are found on both shoots and root growth. When looking at symptoms, concentrate on the outer, advancing edge of diseased area.)

1. Color of blade, leaf tip, leaf margins

2. Leaf lesions, streaks, mottling

3. Leaf wilting, curling

4. Circular patches of dead grass

5. Circular rings of darker green and/or dead grass

6. General thinning and browning of turf

7. Slimy substance on leaves

B. Ways to prevent disease problems

1. Clean all equipment carefully before and after use.

2. Buy healthy turf from a reliable source.

3. Select resistant cultivars.

INFORMATION SHEET

4. Promote vigorous turf growth.
5. Water infrequently and deeply.
6. Control thatch which can harbor disease.
7. Apply chemicals to prevent infection or correct existing problem.

XVI. **Insect problems**

A. Symptoms of insect problems

(NOTE: Examine root and shoot growth as well as surrounding soil for actively feeding insects. Damage may not be obvious until well advanced and appears similar to that caused by drought, heat, disease, nematodes, or nutrient deficiences.)

1. Irregular brown patches of dead grass
2. Plants defoliated to the soil line
3. Sod separates from soil easily
4. Stunted, thin turf with individual plants turning brown and dying
5. Soil mounding or tunneling that smothers or lifts turf resulting in drying and plant death

B. Ways to prevent insect problems

1. Clean all equipment carefully before and after use.
2. Use chemical and mechanical preplanting controls.
3. Select resistant cultivars.
4. Promote vigorous turf growth.
5. Apply chemicals to prevent or control insect infestations.

XVII. **Nematode problems**

A. Symptoms of nematode problems

1. General decline in plant vigor
2. Yellowing leaf color
3. Eventual stunted plant growth

4. Wilting

5. Roots have lesions, knots, or excessive root branching

B. Ways to prevent nematode problems

1. Clean all equipment carefully before and after use.

2. Promote vigorous turf growth.

3. Apply chemicals and mechanical preplanting controls.

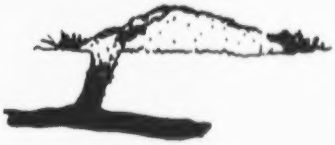
Example: Treat soil with chemical fumigants or heat.

XVIII. Animal pest problems

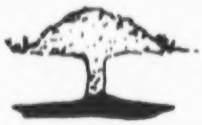
A. Symptoms of animal pests

1. Tunneling

Examples: Moles, gophers



Gopher Tunnel



Mole Tunnel

Courtesy of Oklahoma State University Extension Service

2. Digging and burrowing

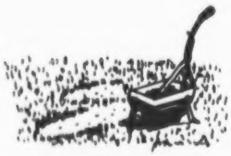
Examples: Crayfish, armadillos, birds, skunks, ground squirrels, mice

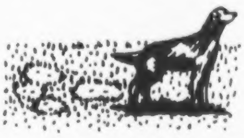
3. Soil compaction

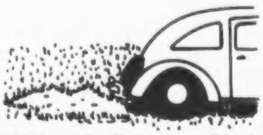
Example: Pedestrian shortcuts

4. Distinct patches of dead grass

Examples: Chemical burns resulting from spilled fertilizer, dog urination, or gasoline







Courtesy of Oklahoma State University Extension Service

5. Gray color and shredded edges of turf

Example: Operators mowing with dull mower blades

INFORMATION SHEET

B. Ways to control animal pests

1. Trapping
2. Poison baits
3. Fumigation
4. Eliminating the attractive food source such as grubs
5. Constructing or planting barriers and walks such as fences or thorny shrubs

ESTABLISHING AND MAINTAINING TURF
UNIT VI

HANDOUT #1 — RECOMMENDED SEEDING RATES FOR SELECTED TURFGRASSES

Turfgrass	Seeding Rate lbs/1000 ft.^{2}
Bermudagrass (Hulled)	3.0 - 8.0
Buffalograss (Burs)	3.0 - 6.0
Centipedegrass	0.5 - 1.0
Tall fescue	7.0 - 9.0
Hard fescue	3.5 - 4.5
Chewing fescue	3.5 - 4.5
Red fescue	3.5 - 4.5
Perennial ryegrass	7.0 - 9.0
Kentucky bluegrass	1.0 - 2.0

ESTABLISHING AND MAINTAINING TURF
UNIT VI

HANDOUT #2 — AVERAGE CUTTING HEIGHTS FOR SELECTED TURFGRASSES

Cutting Height (Inches)	Turfgrass Species	
	Cool Season	Warm Season
0.5 - 1.5	Creeping bentgrass Colonial bentgrass Rough bluegrass	Bermudagrass Zoysiagrass Buffalograss
1.5 - 2.5	Chewing fescue Red fescue Kentucky bluegrass Perennial ryegrass	Centipedegrass Carpetgrass St. Augustinegrass Bahiagrass
2.5 - 3.5	Tall fescue Italian ryegrass	

ESTABLISHING AND MAINTAINING TURF
UNIT VI

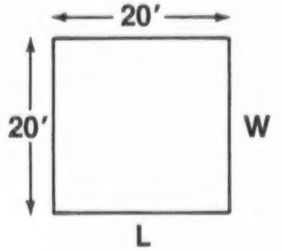
ASSIGNMENT SHEET #1 — CALCULATE LAWN AREAS

NAME ______________________ SCORE ______________________

Directions: Use the following formulas to calculate the lawns shown. Some lawns are combinations of rectangles, squares, circles, and triangles. Calculate each area separately and add the different areas for the total lawn area, or calculate the total area and subtract the non-lawn areas.

Rectangle or square

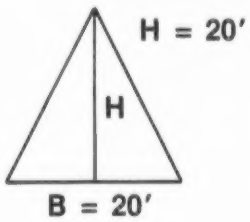
Area = Length (L) × Width (W)



Example: Area = (20′) × (20′) = 400 sq. ft.

Triangle

$$\text{Area} = \frac{\text{Base (B)} \times \text{Height (H)}}{2}$$



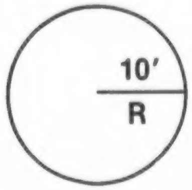
Example:

$$\frac{20' \times 20'}{2} = \frac{400}{2} = 200 \text{ sq. ft.}$$

Circle

Area = $\pi \times \text{Radius (R)}^2$

where $\pi = 3.14$



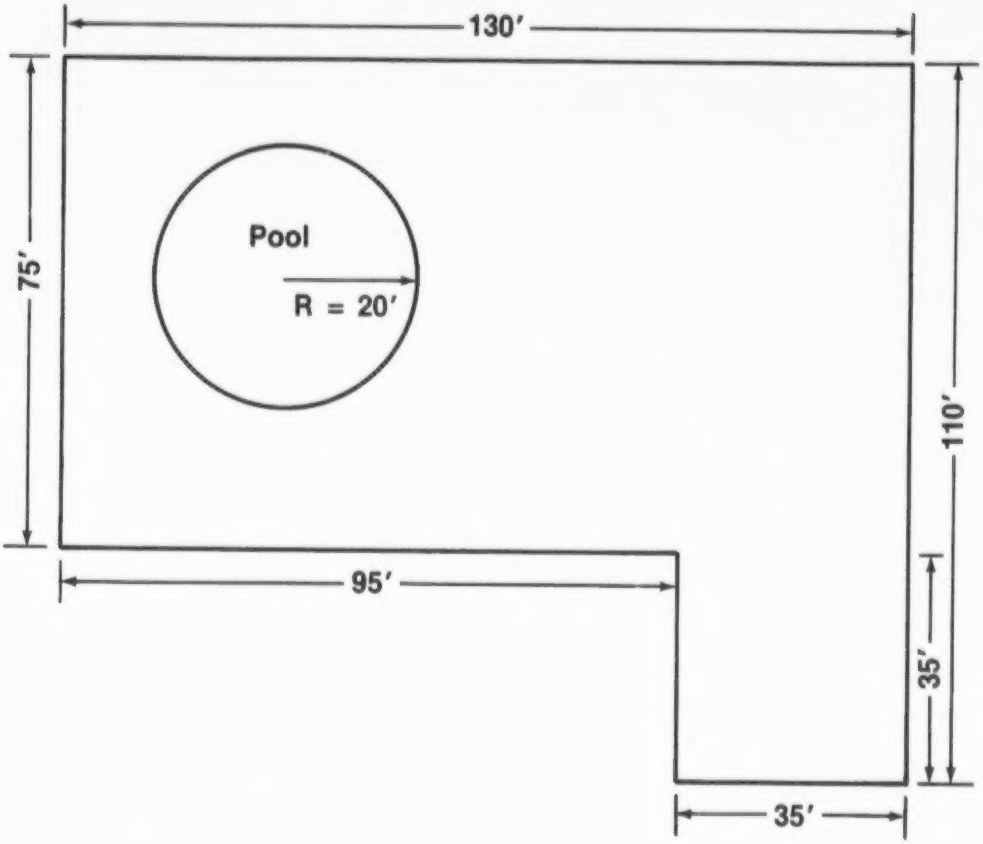
Diameter = 20′
Radius = 10′

Example: $3.14 \times (10')^2 =$
$3.14 \times 10' \times 10' = 3.14$ sq.ft.

ASSIGNMENT SHEET #1

Problems:

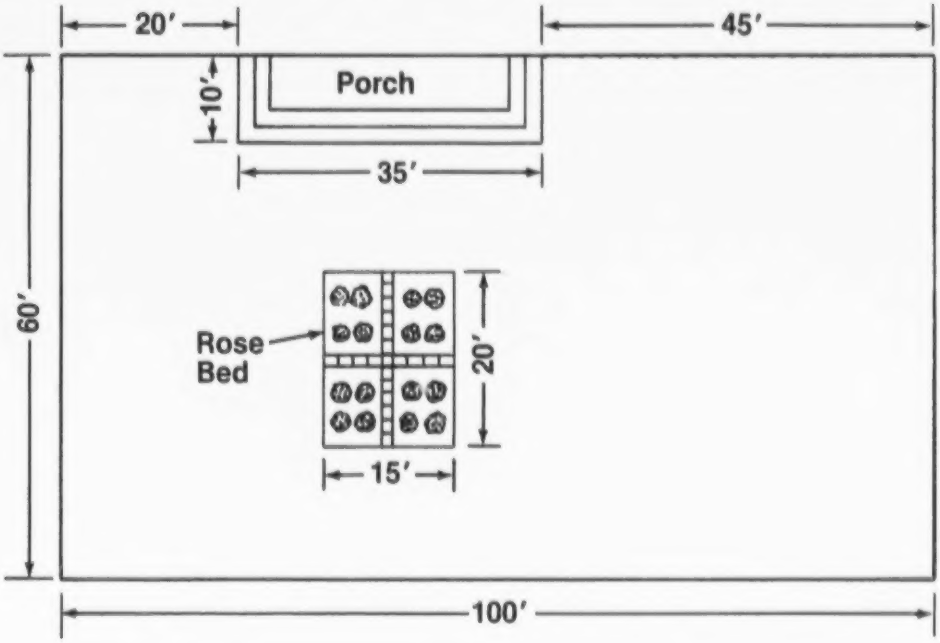
1


130′
75′
Pool
R = 20′
110′
95′
35′
35′

1. Total lawn area = ____________

ASSIGNMENT SHEET #1

2


20′
45′
Porch
10′
35′
60′
Rose
Bed
20′
15′
100′

2. Total lawn area = ____________

ESTABLISHING AND MAINTAINING TURF
UNIT VI

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1

1.	9750	Large rectangle 75′ × 130′
	+ 1225	Small square 35′ × 35′
	− 1256	Pool circle 20′R
	9719	Square feet total lawn area

2.	6000	Large rectangle 60′ × 100′
	− 350	Porch area 10′ × 35′
	− 300	Rose bed area 15′ × 20′
	5350	Square feet total lawn area

ESTABLISHING AND MAINTAINING TURF
UNIT VI

JOB SHEET #1 — PREPARE A TURF PLANTING SITE

A. Tools and materials

1. Wheelbarrow
2. Shovels
3. Spades
4. Forks
5. Hoes
6. Tiller
7. Rakes
8. Roller
9. Gravity spreader
10. Tractor and grading equipment
11. Soil amendments

B. Procedure

1. Measure the area and calculate the square feet. (Assignment Sheet #1)
2. Review recent soil test of area.
3. Remove weeds.

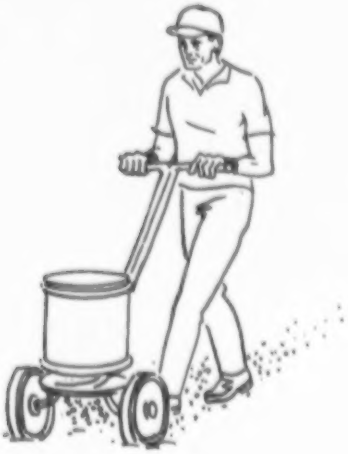
   (NOTE: If herbicides are used, the instructor will apply prior to cultivation.)

4. Remove debris such as wood, rocks, stumps, or pipes above ground.
5. Remove and stockpile usable topsoil if a grade change is necessary.
6. Grade subsoil surface to provide adequate surface drainage without any depressions where water could collect.
   a. Provide a minimum of 2% slope away from buildings.
   b. Avoid slopes more than 25% which are difficult to mow and maintain.

JOB SHEET #1

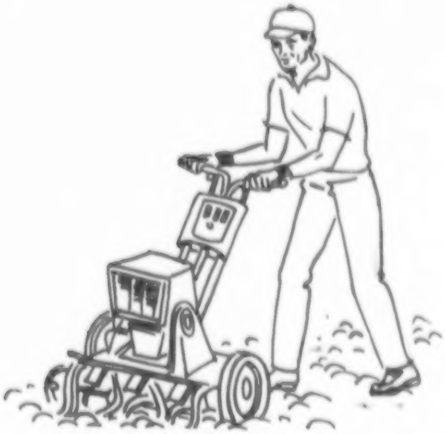
7. Replace topsoil.
8. Grade smoothly.
9. Add recommended soil amendments.

FIGURE 1



10. Cultivate the upper 4 to 10 inches to mix in soil amendments.

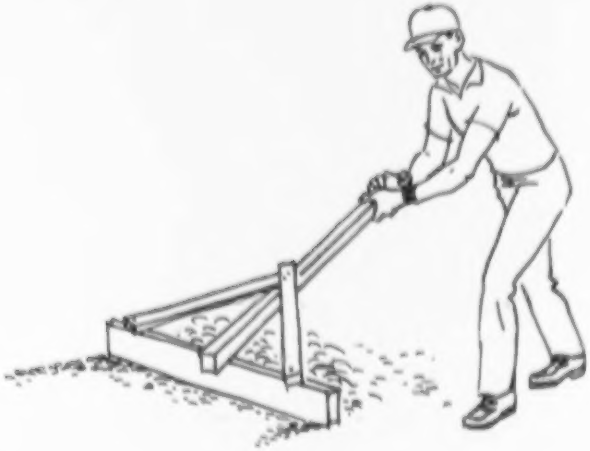
FIGURE 2



JOB SHEET #1

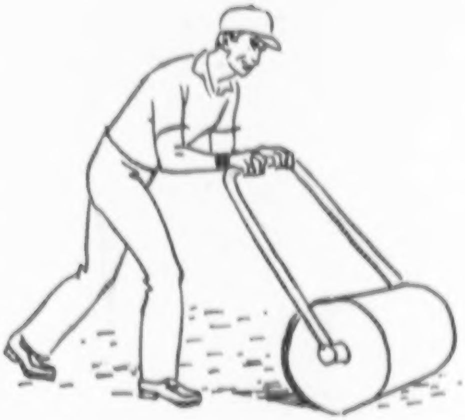
11. Establish final grade by hand raking or using power leveling equipment.

FIGURE 3



12. Roll to firm soil.

FIGURE 4



13. Clean area and dispose of unwanted debris from site.

14. Clean and return tools and materials to correct area.

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ESTABLISHING AND MAINTAINING TURF
UNIT VI

JOB SHEET #2 — PLANT A PREPARED SITE BY SEEDING

A. Tools and materials

1. Seed
2. Seeder
3. Power equipment — rollers, seeders, tiller
4. Mulch
5. Twine or net to hold mulch down
6. Rakes
7. Hand roller
8. Hoes
9. Forks
10. Irrigation equipment
11. Wheelbarrow

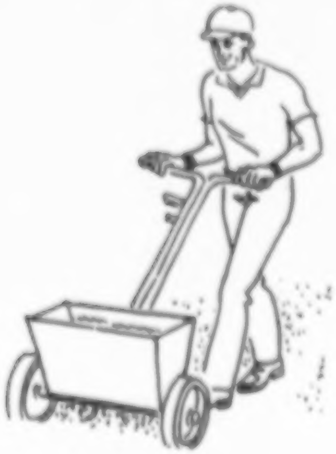
B. Procedure

1. Check soil for adequate moisture. Water planting bed if dry to a depth of 2" to 3" prior to seeding time.
2. Till soil lightly to loosen upper 2" of surface.
3. Rake smooth.
4. Roll soil to firm.
5. Divide seed into two equal amounts.

JOB SHEET #2

6. Spread 1/2 of seed uniformly, north and south.

FIGURE 1



7. Spread other 1/2 of seed uniformly, east and west.
8. Rake seed into the top 1/4 to 1/3 inch layer of soil.
9. Roll to firm soil.

   (NOTE: Seed-soil contact is essential for successful seed germination.)
10. Mulch evenly.
11. Place twine or net over loose mulch such as straw. Secure with pegs.
12. Water seedbed evenly to depth of 2 inches.

    (CAUTION: Do not drag hose across seedbed.)
13. Clean area and dispose of debris.
14. Clean and return tools and materials to correct area.

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ESTABLISHING AND MAINTAINING TURF
UNIT VI

JOB SHEET #3 — PLANT A PREPARED SITE BY SODDING

A. Tools and materials

1. Sod
2. Power equipment — rollers, fork lift
3. Rakes
4. Hand roller
5. Hoes
6. Forks
7. Irrigation equipment
8. Wheelbarrows
9. Shovels
10. Spades
11. Trowels

B. Procedure

(NOTE: Sod should be dense, uniform, and weed-free with no disease, insect, or nematode damage. Sod should be thick enough not to tear when held by one end.)

1. Check soil for adequate moisture and correct if necessary.
2. Transport sod as close to planting site as possible.

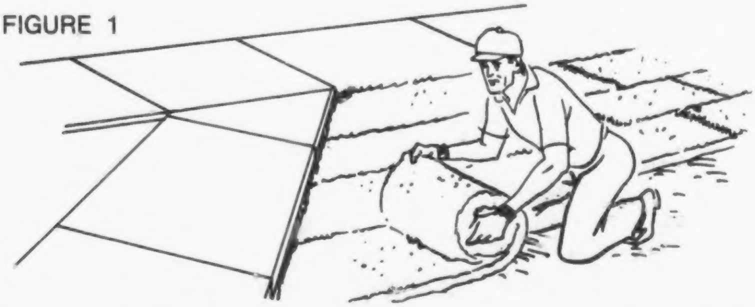
   (NOTE: Sod should be transplanted within 10 to 60 hours after cutting. Do not allow sod to dry out.)

3. Place sod strips on planting bed snugly fitting end to end.
   a. It is helpful to place the first strips along a straight line such as a walk or set string line. Work toward the middle of the area.
   b. Place the sod so the crown is slightly lower than any surrounding drives, walks, or patios.

JOB SHEET #3

4. Place second row of sod strips in an alternate pattern fitting the sides snugly against the previous row but never overlapping the edges.

FIGURE 1



(CAUTION: Do not stretch the strips while placing them on the bed. The sod will shrink, causing cracks between strips, and allowing the edges to dry out.)

5. Trim outside edges to conform with desired planting design.

6. Roll sod perpendicular to the direction the strips were placed to ensure good contact with soil.

7. Water sod area immediately after rolling.

   (NOTE: Large planting areas should be planted in sections to allow sod to be watered in quickly.)

8. Clean area and dispose of debris.

9. Clean and return tools and materials to correct areas.

Illustration reprinted with permission of Ortho Books, ©1981.

ESTABLISHING AND MAINTAINING TURF
UNIT VI

JOB SHEET #4 — PLANT A PREPARED SITE BY SPRIGGING

A. Tools and materials

1. Sprigs
2. Power equipment — rollers, fork lift
3. Rakes
4. Hand roller
5. Hoes
6. Forks
7. Irrigation equipment
8. Wheelbarrows
9. Shovels
10. Spades
11. Trowels

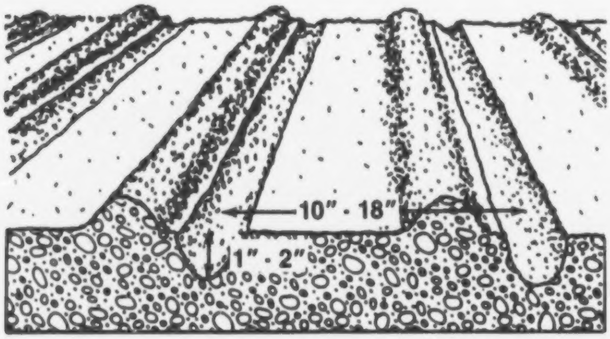
B. Procedure

1. Check soil for adequate moisture and correct if necessary.
2. Transport sprigs to planting site.

   (CAUTION: Do not allow sprigs to dry out.)

3. Dig furrows 1" to 2" deep and 10 to 18 inches apart.

   FIGURE 1

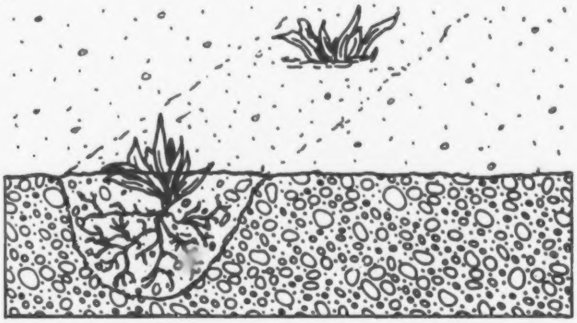


JOB SHEET #4

4. Place sprigs in furrows.

5. Cover sprigs with soil, leaving 1/4 of the sprig above ground.

FIGURE 2



6. Roll planted area to firm soil.

7. Water sprigged area immediately after rolling.

8. Clean area and dispose of debris.

9. Clean and return tools and materials to correct areas.

ESTABLISHING AND MAINTAINING TURF
UNIT VI

JOB SHEET #5 — PLANT A PREPARED SITE BY PLUGGING

A. Tools and materials

1. Plugs
2. Power equipment — rollers, fork lift
3. Rakes
4. Hand roller
5. Hoes
6. Forks
7. Irrigation equipment
8. Wheelbarrows
9. Shovels
10. Spades
11. Trowels

B. Procedure

1. Check soil for adequate moisture and correct if necessary.
2. Transport plugs as close to the planting site as possible.

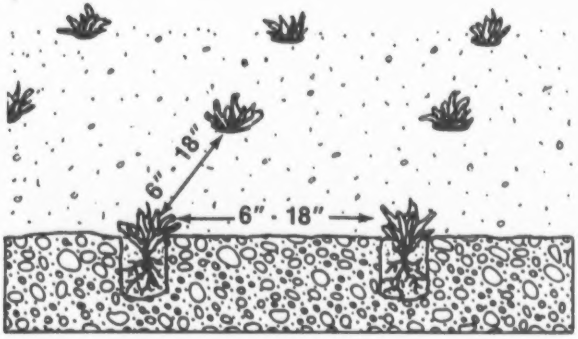
   (NOTE: Plugs may be cut from sod strips at planting site. Do not allow plugs to dry out.)

3. Remove a soil plug from the planting bed or dig a shallow 3" hole with a trowel or hoe.
4. Insert a plug, burying the crown 1" below the surface.

   (NOTE: Plugs are spaced 6 to 18 inches apart. Ask your instructor for the required spacing for this planting job.)

JOB SHEET #5

FIGURE 1



5. Firm the soil around the plug.
6. Roll area after the plugs are set.
7. Water plugged area immediately after rolling.
8. Clean area and dispose of debris.
9. Clean and return tools and materials to correct areas.

ESTABLISHING AND MAINTAINING TURF
UNIT VI

JOB SHEET #6 — PLANT A PREPARED SITE BY STOLONIZING

A. Tools and materials

1. Stolons
2. Power equipment — rollers, fork lift
3. Rakes
4. Hand roller
5. Hoes
6. Forks
7. Irrigation equipment
8. Wheelbarrows
9. Shovels
10. Spades
11. Trowels

B. Procedure (broadcast sprigging)

1. Check soil for moisture and correct if necessary.
2. Transport stolons to planting site.

   (CAUTION: Do not allow stolons to dry out.)

3. Broadcast or evenly spread stolons on soil surface.

   (NOTE: Stolons should be planted in small sections of the new site, usually 3 to 4 feet wide to prevent drying out of stolons.)

4. Topdress stolons with ¼" to 2" soil, or lightly till or disk to partially cover.
5. Roll broadcasted area to firm soil.
6. Water stolonized area lightly immediately after rolling.

JOB SHEET #6

7. Repeat steps 3 through 6 until the site is completely planted.
8. Water complete planting site.
9. Clean area and dispose of debris.
10. Clean and return tools and materials to correct areas.

ESTABLISHING AND MAINTAINING TURF
UNIT VI

JOB SHEET #7 — WINTER OVERSEED AN EXISTING LAWN

A. Tools and materials

1. Seed
2. Rakes
3. Shovels
4. Wheelbarrow
5. Vertical mower
6. Power rakes
7. Seeder (Ask instructor to calibrate)
8. Fertilizer spreader (Ask instructor to calibrate)
9. Mowers
10. Dragging equipment
11. Irrigation equipment
12. Topdressing materials

B. Procedure

1. Transport equipment to planting site.
2. Mow the planting area.
3. Rake off all clippings and other debris.
4. Verti-cut or power rake approximately $^{1}/_{8}$" to $^{1}/_{4}$" deep in one direction such as north and south.
5. Verti-cut or power rake area again east and west.

   (NOTE: If the site is heavily compacted, cultivate or slice three weeks before overseeding.)
6. Rake off all debris.

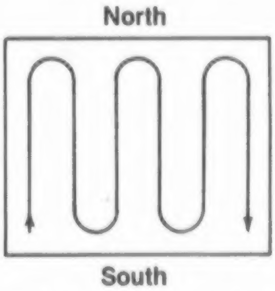
JOB SHEET #7

7. Apply fertilizer as recommended.

8. Divide recommended seed into two equal amounts.

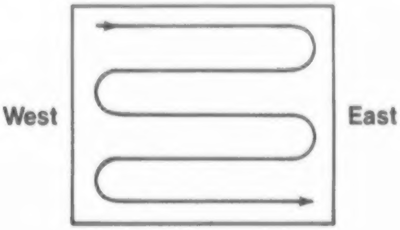
9. Spread 1/2 of seed uniformly, north and south.

FIGURE 1



10. Spread other 1/2 of seed uniformly, east and west.

FIGURE 2



11. Topdress with 1/8 to 1/4 inch layer of sand.

    (NOTE: Topdressing may not be required.)

12. Work seed into turf by hand raking or dragging a flexible steel mat or heavy carpet over the area.

    (NOTE: Seed-soil contact is essential for successful germination.)

13. Water area evenly to a depth of 2 inches.

14. Clean area and dispose of debris.

15. Clean and return tools and materials to correct areas.

ESTABLISHING AND MAINTAINING TURF
UNIT VI

JOB SHEET #8 — REMOVE THATCH FROM ESTABLISHED TURF

A. Tools and materials

1. Wheelbarrow
2. Hand rakes
3. Power rakes
4. Vertical mower
5. Topdressing materials
6. Fertilizer
7. Irrigation equipment
8. Shovels
9. Forks

B. Procedure

1. Clear lawn area of debris.
2. Mow turf if it is too tall.
3. Remove clippings.
4. Vigorously hand rake turf or power rake turf penetrating to the soil surface. Multiple passes may be needed until thatch is removed.

   (NOTE: Vertical mowers may be used on very thick thatch.)
5. Collect the loosened thatch material and discard.
6. Rake surface smooth.
7. Clean and return tools and materials to correct areas.

ESTABLISHING AND MAINTAINING TURF
UNIT VI

PRACTICAL TEST
JOB SHEET #1 — PREPARE A TURF PLANTING SITE

STUDENT'S NAME ______________________________ DATE ____________

EVALUATOR'S NAME ______________________________ ATTEMPT NO. ______

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper tools and materials.	______	______
2. Measured the area.	______	______
3. Reviewed soil test.	______	______
4. Removed unwanted vegetation and debris.	______	______
5. Established necessary grade or slope.	______	______
6. Added and incorporated recommended soil amendments.	______	______
7. Cultivated soil.	______	______
8. Firmed and smoothed final grade.	______	______
9. Cleaned work area and tools.	______	______
10. Checked in/put away tools and materials.	______	______

EVALUATOR'S COMMENTS: ____

____

JOB SHEET #1 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:				
Clods are pea size to golf ball size	4	3	2	1
Amendments are thoroughly incorporated	4	3	2	1
Final grade is correct and uniform	4	3	2	1

EVALUATOR'S COMMENTS: ______________________________

____

PERFORMANCE EVALUATION KEY

4 — Skilled — Can perform job with no additional training.
3 — Moderately skilled — Has performed job during training program; limited additional training may be required.
2 — Limited skill — Has performed job during training program; additional training is required to develop skill.
1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

ESTABLISHING AND MAINTAINING TURF
UNIT VI

PRACTICAL TEST
JOB SHEET #2 — PLANT A PREPARED SITE BY SEEDING

STUDENT'S NAME ______________________________ DATE ____________

EVALUATOR'S NAME ____________________________ ATTEMPT NO. ______

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper tools and materials.	______	______
2. Checked soil for moisture and corrected if necessary.	______	______
3. Filled, raked, and rolled soil.	______	______
4. Distributed seed uniformly and evenly.	______	______
5. Firmed plant materials into good contact with soil surface.	______	______
6. Mulched and secured with net.	______	______
7. Watered seedbed evenly.	______	______
8. Cleaned work area and tools.	______	______
9. Checked in/put away tools and materials.	______	______

EVALUATOR'S COMMENTS: ____

____

JOB SHEET #2 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:

Correct seeds were planted	4	3	2	1
Seed was uniformly distributed	4	3	2	1
Seedbed was properly mulched	4	3	2	1
Seedbed was watered adequately	4	3	2	1
Site area is neat and attractive	4	3	2	1

EVALUATOR'S COMMENTS: ______________________________________

____

PERFORMANCE EVALUATION KEY

4 — Skilled — Can perform job with no additional training.
3 — Moderately skilled — Has performed job during training program; limited additional training may be required.
2 — Limited skill — Has performed job during training program; additional training is required to develop skill.
1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

ESTABLISHING AND MAINTAINING TURF
UNIT VI

PRACTICAL TEST
JOB SHEET #3 — PLANT A PREPARED SITE BY SODDING

STUDENT'S NAME ______________________________ DATE ____________

EVALUATOR'S NAME ____________________________ ATTEMPT NO. ______

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper tools and materials.	______	______
2. Checked soil moisture.	______	______
3. Transported sod to site.	______	______
4. Laid sod correctly to fill area.	______	______
5. Rolled sod into good contact with soil surface.	______	______
6. Watered sod well.	______	______
7. Cleaned work area and tools.	______	______
8. Checked in/put away tools and materials.	______	______

EVALUATOR'S COMMENTS: ____

____

JOB SHEET #3 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:				
Correct sod was planted	4	3	2	1
No cracks between sod	4	3	2	1
No overlaps of sod	4	3	2	1
Sod was watered adequately	4	3	2	1
Evidence of rolling to remove air pockets	4	3	2	1
Site area is neat and attractive	4	3	2	1

EVALUATOR'S COMMENTS: ______________________________

____

PERFORMANCE EVALUATION KEY

4 — Skilled — Can perform job with no additional training.
3 — Moderately skilled — Has performed job during training program; limited additional training may be required.
2 — Limited skill — Has performed job during training program; additional training is required to develop skill.
1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

ESTABLISHING AND MAINTAINING TURF
UNIT VI

PRACTICAL TEST
JOB SHEET #4 — PLANT A PREPARED SITE BY SPRIGGING

STUDENT'S NAME ______________________________ DATE ____________

EVALUATOR'S NAME ____________________________ ATTEMPT NO. ______

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper tools and materials.	______	______
2. Checked soil moisture.	______	______
3. Transported sprigs to site.	______	______
4. Dug furrows correct size.	______	______
5. Placed sprigs in furrows and covered correctly.	______	______
6. Rolled plant materials into good contact with soil surface.	______	______
7. Watered sprigs well.	______	______
8. Cleaned work area and tools.	______	______
8. Checked in/put away tools and materials.	______	______

EVALUATOR'S COMMENTS: ____

____

JOB SHEET #4 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:				
Correct sprigs were planted	4	3	2	1
Sprigs were uniformly planted	4	3	2	1
Sprigs were watered adequately	4	3	2	1
Site area is neat and attractive	4	3	2	1

EVALUATOR'S COMMENTS: ______________________________

____

PERFORMANCE EVALUATION KEY

4 — Skilled — Can perform job with no additional training.
3 — Moderately skilled — Has performed job during training program; limited additional training may be required.
2 — Limited skill — Has performed job during training program; additional training is required to develop skill.
1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

ESTABLISHING AND MAINTAINING TURF
UNIT VI

PRACTICAL TEST
JOB SHEET #5 — PLANT A PREPARED SITE BY PLUGGING

STUDENT'S NAME ______________________ DATE __________

EVALUATOR'S NAME ______________________ ATTEMPT NO. _____

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper tools and materials.	_____	_____
2. Checked soil moisture.	_____	_____
3. Transported plugs to site.	_____	_____
4. Planted plugs in prepared holes.	_____	_____
5. Firmed plugs into good contact with soil surface.	_____	_____
6. Watered plugs in well.	_____	_____
7. Cleaned work area and tools.	_____	_____
8. Checked in/put away tools and materials.	_____	_____

EVALUATOR'S COMMENTS: ____

____

JOB SHEET #5 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:				
	4	3	2	1
Correct plugs were planted				
	4	3	2	1
Plugs were uniformly planted				
	4	3	2	1
Plugs were watered adequately				
	4	3	2	1
Site area is neat and attractive				

EVALUATOR'S COMMENTS: ______________________________

____

PERFORMANCE EVALUATION KEY

4 — Skilled — Can perform job with no additional training.
3 — Moderately skilled — Has performed job during training program; limited additional training may be required.
2 — Limited skill — Has performed job during training program; additional training is required to develop skill.
1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

ESTABLISHING AND MAINTAINING TURF
UNIT VI

PRACTICAL TEST
JOB SHEET #6 — PLANT A PREPARED SITE BY STOLONIZING

STUDENT'S NAME ______________________________ DATE ____________

EVALUATOR'S NAME ____________________________ ATTEMPT NO. ______

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper tools and materials.		
2. Checked soil moisture.		
3. Transported stolons to site.		
4. Distributed stolons uniformly and evenly.		
5. Topdressed stolons.		
6. Firmed stolons into good contact with soil surface.		
7. Watered stolons in well.		
8. Cleaned work area and tools.		
9. Checked in/put away tools and materials.		

EVALUATOR'S COMMENTS: ____

____

JOB SHEET #6 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:

	4	3	2	1
Correct stolons were planted				
	4	3	2	1
Stolons were uniformly planted				
	4	3	2	1
Stolons were watered adequately				
	4	3	2	1
Site area is neat and attractive				

EVALUATOR'S COMMENTS: ______________________________

____

PERFORMANCE EVALUATION KEY

4 — Skilled — Can perform job with no additional training.
3 — Moderately skilled — Has performed job during training program; limited additional training may be required.
2 — Limited skill — Has performed job during training program; additional training is required to develop skill.
1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

ESTABLISHING AND MAINTAINING TURF
UNIT VI

PRACTICAL TEST
JOB SHEET #7 — WINTER OVERSEED AN EXISTING LAWN

STUDENT'S NAME ______________________________ DATE ____________

EVALUATOR'S NAME ____________________________ ATTEMPT NO. ______

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper tools and materials.	______	______
2. Mowed turf evenly.	______	______
3. Verti-cut or power raked area.	______	______
4. Raked off debris.	______	______
5. Applied fertilizer as recommended.	______	______
6. Distributed seed uniformly.	______	______
7. Topdressed area lightly.	______	______
8. Raked evenly.	______	______
9. Applied sufficient water.	______	______
10. Cleaned work area and tools.	______	______
11. Checked in/put away tools and materials.	______	______

EVALUATOR'S COMMENTS: ____

____

JOB SHEET #7 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:

Seed distributed uniformly	4	3	2	1
Fertilizer distributed uniformly	4	3	2	1
Seed bed watered sufficiently	4	3	2	1

EVALUATOR'S COMMENTS: ____

____

PERFORMANCE EVALUATION KEY

4 — Skilled — Can perform job with no additional training.
3 — Moderately skilled — Has performed job during training program; limited additional training may be required.
2 — Limited skill — Has performed job during training program; additional training is required to develop skill.
1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

ESTABLISHING AND MAINTAINING TURF
UNIT VI

PRACTICAL TEST
JOB SHEET #8 — REMOVE THATCH FROM ESTABLISHED TURF

STUDENT'S NAME ______________________________ DATE ____________

EVALUATOR'S NAME ______________________________ ATTEMPT NO. ______

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper tools and materials.	______	______
2. Cleared lawn of debris.	______	______
3. Mowed turf if needed.	______	______
4. Removed clippings.	______	______
5. Hand or power raked turf penetrating to soil surface.	______	______
6. Collected loosened thatch.	______	______
7. Raked surface smooth.	______	______
8. Cleaned work area and tools.	______	______
9. Checked in/put away tools and materials.	______	______

EVALUATOR'S COMMENTS: ____

____

JOB SHEET #8 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:				
	4	3	2	1
Thatch adequately removed				
	4	3	2	1
Site area is neat				

EVALUATOR'S COMMENTS: ______________________________

____

PERFORMANCE EVALUATION KEY

4 — Skilled — Can perform job with no additional training.
3 — Moderately skilled — Has performed job during training program; limited additional training may be required.
2 — Limited skill — Has performed job during training program; additional training is required to develop skill.
1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

ESTABLISHING AND MAINTAINING TURF
UNIT VI

NAME ______________________________ SCORE ______________

TEST

1. Match the terms on the right with the correct definitions.

______a. Piece of grass stolon or rhizome

______b. Plants growing where they are not wanted

______c. Microscopic round worms that are found in plants, soil, and animals

______d. Buildup of old clippings, roots, and stems in growing turf

______e. The transition area from the trunk or shoots to roots

______f. Restoring turfgrass through overseeding or vegetative planting in an existing lawn without complete clearing and reworking of the soil

______g. Method of lawn management which requires complete removal of existing turf, basic site preparation, and replanting with new seed or sod

______h. Top few inches of soil and established turf

______i. Chemical in a volatile gas form which kills nematodes, weeds, seeds, and other pests in a confined area

1. Crown
2. Fumigant
3. Insects
4. Nematodes
5. Reestablishment
6. Renovation
7. Sod
8. Sprig
9. Thatch
10. Weeds

2. Distinguish between the two types of turfgrasses by placing an "X" next to the description of a cool season turfgrass.

______a. Grasses with an optimum growth temperature of 60° to 75°F (15.6° to 23.8°C). Examples include bluegrasses, bentgrasses, and fescues.

______b. Grasses with an optimum growth temperature of 80° to 95°F (26.7° to 35.5°C). Examples include bermudagrasses and zoysiagrasses.

TEST

3. Classify the following methods of turf establishment as sexual propagation (S) or asexual propagation (A).

_____a. Sodding

_____b. Plugging

_____c. Sprigging

_____d. Seeding

_____e. Stolonizing

4. Select the following considerations for establishing turf by seeding by placing an "X" next to the appropriate considerations.

_____a. Seeding rate

_____b. Percent germination

_____c. Topdressing materials

_____d. Seed purity

_____e. Fertilizer rates

_____f. Seed mixtures

_____g. Clipping removal

5. Distinguish between the following techniques which may be used when establishing a turf by placing an "M" next to the description(s) of mulching and a "T" next to those for topdressing.

_____a. Involves applying a thin protective covering of a loose, dry material such as straw over the soil

_____b. Involves applying a thin layer of compatible soil or sand on a new or established turf area

_____c. Used to fill depressions and to help control thatch and retard drying of plant materials

_____d. Used to conserve moisture, protect against runoff and erosion, discourage weeds, and lessen temperature variations

TEST

6. Select true statements concerning turfgrass care after establishment by placing an "X" next to the true statements.

_____a. Irrigate new planting every 5 days moistening the upper 2 inches of soil.

_____b. As turf becomes established, increase irrigation frequency.

_____c. Apply water at a rate the soil can quickly absorb to prevent runoff.

_____d. Never apply fertilizer after planting.

_____e. Apply herbicide immediately after planting.

_____f. Mow turf as appropriate for the turf species, turf use, and season of the year.

7. Complete the following statements concerning guidelines for mowing established turf by circling the correct answers.

a. When mowing heights are set too low, turf will have (**increased, decreased**) root and shoot growth.

b. Removing more than (**1/8, 1/3**) of leaf area when mowing results in partial loss of the shoot or roots and eventually can destroy turf.

c. Alternating mowing patterns each time you cut will (**minimize, increase**) turf wear.

d. Mow (**across, up and down**) steep slopes.

e. Turn corners or directions (**quickly, slowly**) to prevent the mower's wheels from tearing the turf.

f. Check to make sure grass is (**wet, dry**) enough to be mowed.

8. Distinguish between the advantages and disadvantages of clippings by placing an "X" next to the advantages.

_____a. Are a source of plant nutrients, especially nitrogen.

_____b. May contribute to disease occurrence.

_____c. Long clippings may contribute to the thatch layer.

_____d. Moisture is retained.

TEST

9. List three causes of thatch.

a. ______________________________

b. ______________________________

c. ______________________________

10. Select from the following list the damage caused by thatch buildup by placing an "X" next to the correct damages.

_____a. Increased disease and insect damage

_____b. Slow air and water movement through turf

_____c. Deep root development

_____d. Shallow root development

_____e. Dry spots in the turf

11. Distinguish between the methods of cultivating compacted soils by placing the following letters next to the correct descriptions:

- C — Coring
- F — Forking
- SL — Slicing
- SP — Spiking

_____a. Vertically cuts slits 3 to 4 inches long and 3 to 4 inches deep.

_____b. Removes plugs and soil leaving holes 3 to 4 inches deep.

_____c. Hand working a small area with a tined fork by pushing it into the soil 6 to 8 inches deep and then rocking it back and forth loosening the soil.

_____d. Produces shallow holes ½ inch long and ½ to ¾ inch deep.

12. Select true statements concerning turfgrass fertilization by placing an "X" next to the true statements.

_____a. A soil test should be taken before lawn installation and as recommended after establishment.

_____b. Soil amendment applications should be based on the soil test, existing turf condition, thatch, stress, and disease conditions.

_____c. Potassium is needed in the largest amounts by turfgrass.

TEST

13. Select from the following list the factors affecting fertilizer application by placing an "X" next to the correct factors.

    _____a. Spreading patterns

    _____b. Timing

    _____c. Form of fertilizer material

    _____d. Type of turfgrass

    _____e. Equipment

14. List two causes and ways to prevent weed problems.

    a. Causes of weed problems

    1) ______________________________

    2) ______________________________

    b. Ways to prevent weed problems

    1) ______________________________

    2) ______________________________

15. List three symptoms and ways to prevent disease problems.

    a. Symptoms

    1) ______________________________

    2) ______________________________

    3) ______________________________

    b. Ways to prevent diseases

    1) ______________________________

    2) ______________________________

    3) ______________________________

TEST

16. List three symptoms and ways to prevent insect problems.

    a. Symptoms

    1) ______________________________

    2) ______________________________

    3) ______________________________

    b. Ways to prevent insects

    1) ______________________________

    2) ______________________________

    3) ______________________________

17. List two symptoms and ways to prevent nematode problems.

    a. Symptoms

    1) ______________________________

    2) ______________________________

    b. Ways to prevent nematodes

    1) ______________________________

    2) ______________________________

18. List two symptoms and ways to control animal pest problems.

    a. Symptoms

    1) ______________________________

    2) ______________________________

    b. Ways to control animal pests

    1) ______________________________

    2) ______________________________

TEST

(NOTE: If the following activities have not been accomplished prior to the test, ask your instructor when they should be completed.)

19. Calculate lawn areas. (Assignment Sheet #1)

20. Demonstrate the ability to:

    a. Prepare a turf planting site. (Job Sheet #1)

    b. Plant a prepared site by seeding. (Job Sheet #2)

    c. Plant a prepared site by sodding. (Job Sheet #3)

    d. Plant a prepared site by sprigging. (Job Sheet #4)

    e. Plant a prepared site by plugging. (Job Sheet #5)

    f. Plant a prepared site by stolonizing. (Job Sheet #6)

    g. Winter overseed an existing lawn. (Job Sheet #7)

    h. Remove thatch from established turf. (Job Sheet #8)

ESTABLISHING AND MAINTAINING TURF
UNIT VI

ANSWERS TO TEST

1. a. 8
   b. 10
   c. 4
   d. 9
   e. 1
   f. 6
   g. 5
   h. 7
   i. 2

2. a

3. a. A
   b. A
   c. A
   d. S
   e. A

4. a, b, d, f, g

5. a. M
   b. T
   c. T
   d. M

6. c, f

7. a. Increased
   b. $^1/_3$
   c. Minimize
   d. Across
   e. Slowly
   f. Dry

8. a, d

9. Any three of the following:

   a. Rapid turf growth producing stems and roots faster than the vegetation can decompose
   b. Reduced microorganism, earthworm, and insect activity
   c. Turf allowed to grow too tall, then cut severely (more than $^1/_3$ of top growth)
   d. Long clippings left on turf
   e. Disease
   f. Planting of the more vigorous turfgrass cultivars

ANSWERS TO TEST

10. a, b, d, e

11. a. SL
    b. C
    c. F
    d. SP

12. a, b

13. a, b, c, e

14. Any two of the following for both a and b.

    a. Causes
        1) Thinned turfgrass (many reasons)
        2) Weed seeds spread by several sources

    b. Ways to prevent weeds
        1) Clean all equipment carefully before and after use.
        2) Promote vigorous turf growth.
        3) Use chemical and mechanical preplanting control.
        4) Mow to reduce weed growth competition.
        5) Apply chemicals for selective weed control after turf establishment.

15. Any three of the following for both a and b.

    a. Symptoms
        1) Color of blade, leaf tip, leaf margins
        2) Leaf lesions, streaks, mottling
        3) Leaf wilting, curling
        4) Circular patches of dead grass
        5) Circular rings of darker green and/or dead grass
        6) General thinning and browning of turf
        7) Slimy substance on leaves

    b. Ways to prevent diseases
        1) Clean all equipment carefully before and after use.
        2) Buy healthy turf from a reliable source.
        3) Select resistant cultivars.
        4) Promote vigorous turf growth.
        5) Water infrequently and deeply.
        6) Control thatch which can harbor disease.
        7) Apply chemicals to prevent infection or correct existing problem.

ANSWERS TO TEST

16. Any three of the following for both a and b.

    a. Symptoms
        1) Irregular brown patches of dead grass
        2) Plants defoliated to the soil line
        3) Sod separates from soil easily
        4) Stunted, thin turf with individual plants turning brown and dying
        5) Soil mounding or tunneling that smothers or lifts turf resulting in drying and plant death

    b. Ways to prevent insects
        1) Clean all equipment carefully before and after use.
        2) Use chemical and mechanical preplanting controls.
        3) Select resistant cultivars.
        4) Promote vigorous turf growth.
        5) Apply chemicals to prevent or control insect infestations.

17. Any two of the following for both a and b.

    a. Symptoms
        1) General decline in plant vigor
        2) Yellowing leaf color
        3) Eventual stunted plant growth
        4) Wilting
        5) Roots have lesions, knots, or excessive root branching

    b. Ways to prevent nematodes
        1) Clean all equipment carefully before and after use.
        2) Promote vigorous turf growth.
        3) Apply chemicals and mechanical preplanting controls.

18. Any two of the following for both a and b.

    a. Symptoms
        1) Tunneling
        2) Digging and burrowing
        3) Soil compaction
        4) Distinct patches of dead grass
        5) Gray color and shredded edges of turf

    b. Ways to control animal pests
        1) Trapping
        2) Poison baits
        3) Fumigation
        4) Eliminating the attractive food source such as grubs
        5) Constructing or planting barriers and walks such as fences or thorny shrubs

19. Evaluated to the satisfaction of the instructor

20. Performance skills evaluated to the satisfaction of the instructor